

# The Iron Age

## A Review of the Hardware, Iron and Metal Trades.

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**Mundy's Hoisting Engines.**  
We show in the accompanying illustration a double drum dock hoisting engine, mounted on trucks, ready for use. It has 6x12 cylinders and an independent steam pump machine for feeding the boiler. The hoisting drum is connected to the gearing by means of a friction clutch formed in the side of one of the gear wheels and end of the drum. When hoisting is to be done a lever forces the drum against the cone upon the wheel. This arrangement saves much annoyance in the way of sticking and tearing of goods in hatchways. The engineer can tell the moment a thing is fast, as the drum will slip, and it will require an extra pressure on the lever to tear anything or do damage. Where a greater weight is to be hoisted, more pressure is put upon the lever. This machine is capable of lifting a weight of 3000 pounds. It is manufactured by J. S. Mundy, of No. 7 Railroad avenue, Newark, N. J.

### Ornamental Ironwork.

In a lecture lately delivered by Prof. Pliny E. Chase before the Franklin Institute, we find the following:

The earliest historical reference to iron is found in Genesis, iv., 23. "Tubal Cain, an instructor of every artificer in brass and iron," lived, according to Biblical chronology, about 3700 B. C. He is supposed by many, and with good reason, to have been the same as Vulcan. He was not merely a smith, but he was an ornamental iron worker, "an instructor of every artificer." The Hebrew word *khoresh*, "artificer, cutting instrument," is akin to *khoresh*, "cunning worker," both being derived from *kharash*, "to cut, carve, engrave, sculpture." Among other Biblical allusions we may note "an instrument of iron," Num., xxxv, 16; the giant Og's "bedstead of iron," Deut., iii, 11; "chariots of iron," Josh., xvii, 16; "saws, harrows of iron and axes of iron," 2 Sam., xii, 31; "chains and fetters of iron," Ps., cxlii, 8; "an iron pillar," Jer., i, 18.

Some doubts have been expressed whether Homer knew anything of iron, but Hesiod, who, according to Herodotus, was a contemporary of Homer, speaks of the "iron age," and the iron money of Lycurgus was in circulation about 850 B. C. Notwithstanding the interference of rust with the preservation of iron-work, iron hatchets have been found in the Etruscan tombs; an iron forge, tools and nails among the lake dwellings of Switzerland; and iron pillars are still standing in India, which are supposed to be more than 1500 years old. Rings, both of gold and of iron, circulated as money in Britain, at the time of the Roman conquest, but they were probably imported. Iron works were in active operation upon the island in A. D. 120.

The peculiar combination of carbon with iron, which we call steel, and the art of tempering, seem to have been known in prehistoric times. At the beginning of the Christian era the best steel was imported into Rome from China, that of Parthia being inferior of quality. Steel armor was in common use among the soldiers of William the Conqueror. Steel was manufactured in Sweden as early as A. D. 1340, but the art of fusing steel in a crucible, and then casting it into bars so as to form a homogeneous "cast steel," was invented at Sheffield in 1750, and was long kept secret. Bessemer steel is prepared by forcing a powerful current of air through a quantity of melted iron. The oxygen of the air, uniting with the carbon and silicon and other impurities of the iron, produces rapid combustion and intense heat. The blast is continued until the carbon is nearly all consumed, when an alloy called "ferro-manganese" is added, in such proportions as are needed to rebaronize the metal and produce such "low" or "high" grade of steel as may be required. The largest present use of Bessemer metal is in the manufacture of steel rails of a "low" grade, combining great tenacity and durability, with slight brittleness and feeble tempering properties.

The art of casting iron seems to be quite a modern one, but the date of its invention is uncertain. There is a cast iron grave slab in Sussex, England, made about A. D. 1350. A minute proportion of phosphorus, which renders iron wholly unfit for the Bessemer process, adds greatly to its fluidity, as is shown by the remarkably sharp and beautiful ornamental castings in Berlin iron. The Centennial display, by American iron founders, of cast statuary, vases, railings, bronzed and enameled work, stoves, grates, &c., showed a taste of design and care of execution worthy of almost unqualified praise. The architectural combination of cast and wrought iron, in the structure of the Main Building, also produced many pleasing and commendable effects. But there seems to have been little thought of the admirable results which might be reached by a treatment similar to that of the best Japanese bronzes; the casting being regarded merely as a convenient way of forming a mass which can be more readily cut into shape than a larger piece of metal.

Both cast and wrought iron admirably illustrate the importance of the great natural principle of oscillation or vibration. It is now commonly believed that no two material particles are in absolute contact, but that, even in the most solid substances, there are continual internal tremors and orbital motions, much more complicated than those which keep the planets and "stars in their courses," and yet governed by similar laws. In consequence of such internal motions, gliders and rocks and metals can be made to "flow," not only through the intervention of the fiery fingers of heat and flame, but also by simple continuous pressure. M. Tresca, who has studied the subject very carefully, is unable to find any limit between the fluid and the solid conditions of matter. There are merely differences of viscosity, analogous to that between water and molasses. By means of this flow, iron and many other metals may be rolled into sheets, drawn into rods or wires, or hammered into various desired shapes by skillful workmen. Here is a core chuck, which can be put into a turning lathe, for shaping a flat disk of metal into a hollow vessel. As the chuck revolves, a gentle, steady pressure causes the flowing particles to adjust themselves to its sides, so that, by having proper cores, we can

served, which are worthy of special study. Candelabra, grilles, railings, newels, balusters, crosses, brackets and rings for cornice poles, chapel screens, gargoyle, vanes, bolts, hinges, locks, keys and escutcheons, knockers, handles and rings for bells and doors, are decorated with *cisen-blumen* or flower work of beaten iron, or with various tracery, both serious and grotesque. They display an exuberance of invention and judicious taste which are calculated to enhance our respect for the earnestness and thoughtfulness of the unknown workmen, whose resounding hammers so lastingly impressed lessons of faith, hope and love.

In Ireland, Bohemia, Switzerland, and especially in the Tyrol, men in armor, bears or other animals, skillfully wrought, and holding the flag of the district or canton, are often found in the public squares or market places. At Jenbach there are remains of ancient smelting works, and of a forge which seemed specially devoted to a peculiar symbolic teaching. The great gray stone houses of the village are adorned by emblems of love and social feeling, being nearly all protected by curious huge dolpins, which are, apparently, just on the point of flitting from the water-sprouts. In nearly every village church or graveyard the artistic eye may be gratified by contemplating the taste

It is a quarter of a century since the first London "world's fair" revived a European interest in the capabilities of wrought iron for artistic uses. The progress of the revival is most strikingly exemplified in the Oxford Museum, which was erected in 1867, but traces of it are to be seen in all directions about the modern public and private edifices of Great Britain, as well as in many of the churches. A notable example of good ecclesiastical work is the Hereford Cathedral screen, which was shown in the International Exhibition of 1862 before it was removed to the place for which it was designed. Dr. Dresser speaks of it as one of the finest examples of artistic work with which he is acquainted. The grilles, altar rail standards and English fire-dogs in the present Loan Exhibition of the Pennsylvania Museum and School of Industrial Art, placed, as they are, beside a pair of ornamental Florentine andirons of the sixteenth century, show that neither good taste nor skillful execution are wanting in the smiths of our day, and that an educated demand will call out work which may challenge comparison with anything medieval. The pagoda-like pavilion of Messrs. Hart, Son, Peard & Co., with its great variety of contents, cast, woven or hammered into "joys forever," justly claimed a large share of

bulged tripod dinner pot, which is used the world over, is copied from Chinese incense burners that were in use more than 5000 years ago. The Chinese have long had a mania for collecting old bells and vases, partly from their universal reverence for antiquity, partly for the severe simplicity of outline and garniture by which the articles are generally characterized, partly for their moral lessons and associations. A motto from Confucius, or a line of wise advice from some other favorite author, is commonly cast, stamped or cut into the bronze; the "all-seeing eye," under various modes of conventional treatment, looks from the outer surface, even as it looks from the amulets and edifices of Egypt and Yucatan; the three feet are said to represent the three guardian spirits that watch over the emperor, the nobles and the people. Nearly all the old metallic vases have a special history, independent of their antiquity; for it has been a practice from time immemorial to use them as presents from princes and nobles and men of wealth or station to those whom they wished to honor. In the magnificent and unique collections of cloisonné enamels which adorned our Centennial, the delicate filigree and the richly variegated hues of the cellular glazing, seemed to be lavished with a peculiarly loving tenderness on the old homely and home-like form which we all know so well. Our workmen enamel iron skillfully for common purposes; who doubts that they might rival their almond-eyed brethren in applying the art to aesthetic purposes, if they were rightly encouraged? Any ornamentation upon articles of daily use, especially if it be symbolic, or otherwise suggestive of high ideals, may become a source of continual gratification and of constant ennobling instruction.

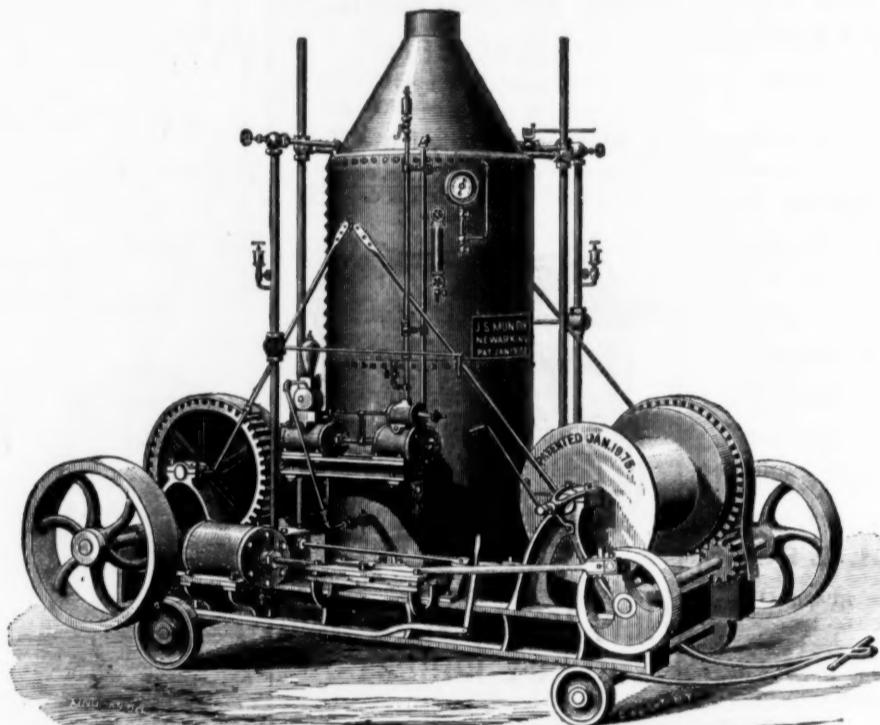
I can think of no decorative process that has ever been employed upon any metal which is not equally suited for iron; indeed, I doubt whether there is one which has not been repeatedly and successfully tried upon that most precious metal. A judicious renaissance may lend new force to the Jewish legend, which has been so well illustrated by Schuenscille with his brush and by Sartain with his burin. The story runs, that when the temple was finished Solomon gave a feast to his artificers. On unveling the throne a blacksmith was found in the seat of honor, on the right of the king's place. The people clamored, and the guards wished to cut him down, but Solomon commanding him to speak, he said: "Thou hast, O king, invited all craftsmen but me; yet how could these builders have raised the temple without the tools I furnished?" "True," answered Solomon, "the seat is his of right. All honor to the iron worker."

### Economy in British Manufactures.—

A paper lately read before the London Society of Arts explains two things: 1st, How the British manufacturers undersell us in cotton goods; 2d, Why our cotton goods are so successfully competing with those of British make in a number of foreign markets. The paper in question minutely explained and approved the processes by which manufacturers and merchants sell goods that are stated to be "a composition of flour, tallow and china clay, with a little cotton added to make it stick." The legitimate application is only for appearance, and neither deceives nor injures. This illegitimate is designed to create a false weight and appearance, and consists of paste mixed with oil. It softens the foreign ingredients, renders the whole adhesive, and will avoid putrefaction.

The legitimate application is only for appearance, and neither deceives nor injures. This illegitimate is designed to create a false weight and appearance, and consists of paste mixed with oil. It softens the foreign ingredients, renders the whole adhesive, and will avoid putrefaction. The discussion in the society recommended great care in obtaining a sound and pure wheat flour to make the adulteration pass, and, suggesting that "as a general rule more than the whole margin of the manufacturers' profit lies within the size used," urged special attention to introducing the counterfeit.

During the past 18 months the Ordnance Bureau of the Navy Department has had 31 of the old smooth bore 11 inch guns converted into 8 inch rifled guns by lining them with steel tubes, but the work will soon be suspended for the want of funds. These guns will be placed on the largest ships which may be fitted out during the next fiscal year. None can be fitted out this year, as there is no money available for such purpose. The government has nearly 1000 of old smooth bore guns on hand, many of which can be converted into efficient rifled guns if Congress will make the necessary appropriation. The work of converting those above mentioned has been done at the Cold Spring Foundry, opposite West Point, N. Y., and at the South Boston Iron Works. The only American vessel now armed with rifled guns is the Trenton, flagship of the European squadron.



DOUBLE DRUM DOCK ENGINE BY J. S. MUNDY.

"spin" bowls, vases, teapots, creamers and various useful or ornamental dishes with great rapidity.

After the vessel is spun, it may be prepared for ornamenting by vibrations and flow of another kind. You remember the beautiful *repoussé* work in many of the departments of the Exhibition, and some of you, doubtless, were curious enough to inquire how it was made. The old method was by simple, careful hammering from the back; but there was always danger of an unlucky blow, that would break the metal and ruin the work of many days or months. Here is a "snarling," or *repoussé* iron, firmly fastened in a vise. Mr. Krider has kindly sent us one of his skillful workmen, who will show us the process of snarling. The floral or other design is drawn on the outside of the vessel, and you see that when Mr. Sloan hammers on the end of the snarler which is nearest the vase, the whole tool is set in vibration, and the rapid, gentle taps of the other end gradually raise a knot or snarl of the desired height and outline. After the snarling or *repoussé* work is done, the chasing process follows. The hollow is filled, as you observe, with a softish cement, which yields slightly to the pressure of the chisel or graver, or such other tool as the artist may select from this large assortment, and the design is thus wrought out into the beautifully finished details of stem and leaf, stamen and petal, and tendril and delicate veining.

Iron is fitted by its cheapness, strength, elasticity, malleability, ductility and plasticity, for general application to ornamental uses and for taking expressions in tracing and foliage such as no other material can supply. The processes which I have just explained furnish an immense addition to the facilities of the artisan for the expression of his thoughts, and make it the more wonderful, as well as the more deplorable, that the aesthetic treatment of wrought iron and steel should have become so nearly a lost art. In all parts of Europe there are many medieval specimens of such treatment pre-

\* The terms "spinning" and "snarling" seem to have been borrowed from the textile arts. The French word *repoussé* signifies "pushed back," indicating the mode of hammering.

displayed in a cross, or a rood screen, or an altar gate, or a chandelier, or the ridge cresting and terminals which wed the gothic architecture to the sky and landscape, as if with a fringed network of delicate lace on the delicate gray, and against the blue. Sometimes the rods of the screen are so arranged in perspective as to represent an iron arched arbor, under which one must walk in traversing the length of the aisles. Sometimes the symbolism is made still more expressive by combining rich clustering vines with the intricate blossoms of passion flowers, displaying a wealth of tendrils and leaves naturally and gracefully entwining the pinnacles of a simple or rustic gate; always the evidences of devout aspiration, childlike trust, deep feeling and loving labor, are such as to bring us into a reverent sympathy with the artists who sought to give visible utterance to some of the most universal and most far-reaching longings of humanity.

Near the west door of the Antwerp Cathedral is a well with Gothic canopy and tracery of iron, surmounted by the statue of a knight in armor. It was executed in 1480 by Quentin Matsys, "at one time a blacksmith, afterward a famous painter," whose romantic history is briefly commemorated by the inscription on a neighboring tablet: "Connubialis Amor de Mulciber fecit Apellem"—connubial love made an Apelles from a Vulcan. It is said that this first "learned blacksmith" fell in love with a painter's daughter, and in order to obtain her for his bride he changed his profession, acquiring even greater reputation as a colorist than he had gained by his handiwork at the forge. In the knowledge of that universal language which rings so sweetly in the ears of youthful admirers, he set a precedent for the learned blacksmith of our own days; but, unlike his far famed successor, he manifested no disposition to trace the universal language into all its dialects. His parity of success in his two vocations shows that he had the fire of true artistic genius, and his fame may encourage the wielder of the hammer, as well as the sitter at the easel, to look for an ever-ready appreciation of whatever depth of thought finds expression through patient, faithful work.

I have spoken of the symbolic thought which was so generally expressed by the iron workers of the cinque-ento. How can it be better revived and expanded than by taking lessons from the old schoolmasters of Eastern Asia, "these from the land of Sinim?" The gipsy kettle, as it is often called, the common

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### Iron Buildings, and Faults in Construction to be Avoided.

(Concluded.)

That these views are recognized as sound by parties directly interested, I cite the case of Messrs. Arnold & Constable. In 1867 this firm erected their dry goods store on Broadway, southwest corner of Nineteenth street—a large building having a marble front and using the ordinary wooden floor beams. Ten years later (1877) they added on to the rear a building of equal size, fronting on Fifth avenue. This latter building has an iron front of identically the same pattern as the stone one, and the floors are constructed with rolled wrought iron beams and brick arch fillings.

Nos. 7 and 9 Bond street, adjoining the burned buildings, have iron fronts. The flames lapped around and blackened the western portion. But the head did not visibly expand or injure the front. So perfect remain all the joints that the blade of a lancet cannot be thrust in any one of them.

In a fire of a very serious nature, which occurred in the trade buildings, Nos. 90, 92 and 94 Franklin street, corner of Church, during the month of March, 1877, the fronts, which were of cast iron, were uninjured, though blackened by the smoke and flames that poured from most of the windows. The front came out as bright and as new in appearance as ever after being scraped and repainted.

In all fires that have occurred no cast iron column in a molten state has been found. Cracked and broken it may be, but not melted. There is a popular error that if a column be made red-hot and cold water then thrown upon it, it will warp and crack and precipitate the load above. This might be true in a column of small diameter and thin metal. In columns of 8 inches diameter and upward, and with a thickness of three-quarter inch metal, it will not be found true. This has been repeatedly verified in the following way: It has sometimes happened that a column would be found warped after casting in the foundry. To remedy this defect the column would be made red-hot, and by means of powerful screws the parts forced not only to the position required, but in some cases several inches beyond it; yet, after cooling, the column would be found warped, exactly as at first. Even cold water dashed upon it when red-hot to secure the set of the column results without success. For the columns in the interior of a building the minimum thickness of metal should be three-quarters of an inch, thereby avoiding warping or cracking when subjected to fire and water combined.

On an iron front there are many castings of thin metal—such as arches, cornices, sills, etc.—as thin as stove plate. Now, in an ordinary stove, if certain parts be made red-hot and cold water thrown upon them, it will warp and crack the metal. But this only shows a mechanical defect in its construction; for it is quite possible so to construct a stove that it would stand such a test without damage, though repeated many times a day for years. The very position of the light castings on a front, as well as their construction, leaves but little risk from this source. In any event the shell work can be readily repaired or replaced.

As the contractor for the ironwork of the large carriage warehouse, Nos. 49, 51 and 53 Lafayette place, running through and being Nos. 740 and 742 Broadway—81 feet frontage on the first street and 51 feet on the latter, with a depth of 275 feet—in the month of April, 1870, I had actual experience with iron in the case of this fallen building. A portion of the side wall, 85 feet long and five stories in height, fell. The walls were run up during extremely cold weather. The frost had destroyed the adhesive qualities of the mortar, and a mixed filling of snow and frozen earth against the foundation, together with the water which poured off the roof during heavy rains, undermined the foundations and caused the disaster. The iron front on Lafayette place, nearest the fallen wall, was pushed out from a plumb line, which necessitated a portion being taken down and re-erected. On cleaning away the mass of debris—bricks, splintered floor timbers and wooden girders—not a single one of the interior iron columns was found broken: simply a few of the iron plates between the columns were found in pieces.

For the fronts of buildings, after seeing much, reading much and hearing much, I affirm the superiority of cast iron, and that too under whatever circumstances it may be placed. The material is all right. In construction there is room for improvement.

In the Bogardus fronts the box lintel (and cornice) courses sustained the columns, and the columns in turn sustained another series of lintels. This plan being repeated to the top of the building, the columns and lintels all bolted firmly together. The plan now commonly in vogue is to set one column directly on top of another for the full height, the different columns being bolted together through strong ears cast on the columns with an intermediate plate. The fascia, cornices, sills, etc., are then screwed or otherwise fastened on. The common construction of an iron front—as in Bond street and at 444 Broadway—is such that it is almost sure to go altogether when any portion of it gives way.

These plans of indissolubly bolting the columns together are wrong. The front must be allowed to fall part by part, and not all together. If in a fire the fifth story of the building falls in, the fifth tier of columns must be permitted to go to, and when the fourth story goes the fourth tier of columns will also go, and so on. A construction that permits of this is readily accomplished by using a plate of the usual thickness between the columns. This plate is made with raised ledges on the top and on the bottom, so that the columns, so to

speak, will set into the plate, the plate having a greater thickness outside than between the columns. The ledges do not run continuously around, but have breaks in them, in order that wedges may be driven in between the column and plate in plumbing up. On each side of this plate are two ears, and from each of the ears extending over to the corresponding ears of the plates in the next vertical tier of columns are horizontal wrought iron rods. On the back of the plate is also an ear with which to anchor as usual to the floor beams. This plan of construction holds the work equally as firm as any other, and yet it permits any upper story to be pulled away; indeed, almost any single upper column, without overthrowing the remainder of the front.

The main or roof cornice should be of cast iron instead of the flimsy galvanized iron cornices so generally used. Here and there a cast iron cornice may be seen, but their use should be the rule and not the exception.

Then, as to rolling shutters on the first story, they should be made so that they can be opened, or in part opened, from the outside. This is readily accomplished by slightly narrowing the width for a few feet up from the bottom, so that that portion of the shutter will not enter the groove, but leaving the bottom bar the full width, so as to travel up and down the groove. Then by a suitable connection at the meeting point of the narrowed curtain, which does not travel in the groove, and the wider curtain which does, a ready means is given to firemen to sever the connections, and the lower part of the shutter drops down and permits free egress to the building. The building law now requires all fire-proof shutters or blinds put upon the fronts or sides of any building on the street fronts, above the first story, to be constructed so that they can be closed and opened from the outside. The entrance of burglars through the front rolling shutter openings need not be feared.

With the advancement of the architectural iron business and the increase of competition, many economical devices have been introduced not always legitimate in their character. So wide a field is there for deception on the part of contractors that a number of building laws have from time to time been enacted to prevent the public from being imposed upon, and to insure greater security of life and property. The law requiring the testing of iron beams, girders and lintels is designed to prevent the use of such castings until it is ascertained by actual test what weight they can safely bear. Great facilities exist for covering up defects. Such pieces, for instance, may be made of poor metal, with sand holes, or other imperfections, which may be concealed with a cement in common use among iron workers, and which becomes nearly as hard as iron. It is almost impossible to detect such deceptions, except by the closest scrutiny and the vigorous use of the hammer and chisel. This law met with great opposition from those who claim that the strength of iron can be ascertained by mechanical rules, and argue that tests are hence unnecessary. To this idea is opposed the fact that poor metal and invisible flaws and other imperfections render all calculations on its strength, to a great extent, unreliable. The fire laws which have been introduced to render buildings more nearly fire-proof were first applied as an experiment to the fire limits included between Chatham street, East Broadway, Grand street and the North River. The limit was next extended to Fourteenth street, and from the North to the East rivers. They were afterward extended to Twenty-third street; next to Thirty-fourth street, then to Forty-second street, afterward to Fifty-second street, and finally to include the whole island.

In 1866 a law was enacted in New York requiring fire-proof cornices and gutters to be placed upon all buildings thereafter to be erected, and that all decayed or damaged cornices be replaced with those of fire-proof material. An instance illustrating the necessity of this law occurred in a fire in Sixth avenue and Forty-fifth street, in which the flames extended across the street and caught on the wooden cornices of the buildings opposite. The law also requires the use of iron shutters on warehouses, but when this ordinance was enacted it met with great opposition, and was regarded by some as very oppressive. One party bricked up the windows of a valuable house in preference to putting on iron shutters against his will. The history of this regulation is somewhat curious. The first law required iron shutters only on new buildings; finally, on account of the occurrence of several casualties from the omission to close the shutters of their buildings after business hours, an amendment was enacted compelling all persons to close the shutters of their buildings after business hours. It required three years of experience, therefore, to obtain a perfect law. A fire occurred at 202 Broadway, in which a building was destroyed. The flames gained access to it from a burning building on Fulton street, through its unprotected windows in the rear, while other buildings equally exposed, being protected by iron shutters, escaped. The saving of some valuable warehouses on Catherine lane, during the burning of Appleton's buildings, was due to the protection of iron shutters.

As a nation we cannot afford to waste the wealth yearly consumed by fires. Ten times too much is paid for insurance and protection that there is any need of doing. As was said recently in *The Iron Age*: "Insurance creates nothing to replace that which is destroyed. On the contrary, it can, at most, only distribute the losses which it is powerless to avert. It collects \$60,000,000 in premiums annually, pays about \$30,000,000 on losses, and absorbs the remaining \$30,000,000 for expenses and profits. It may occasionally benefit the individual, but, obviously, it does not benefit the community, especially as it encourages both carelessness and crime. The evil is one which will probably work out its own cure sooner or later, for what is contrary to public policy cannot long retain public favor; but in the meantime it devolves upon the people to protect themselves against their own folly in this matter, by the enactment of ordinances which shall compel a gradual approximation to fire-proof standards in the architecture of our cities."

\* From advanced sheets of a second edition of "Architectural Iron Work," by Wm. J. Fryer.

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to the shape of the pile, thereby welding the pile into a homogeneous mass.

The following design was patented during the week ending March 13, 1877:

9848.—*Glassware.*—David Barker, Pittsburgh, Pa., assignor to Crystal Glass Company, same place. Term of patent 3½ years.

**The Bronze Groups for the Lincoln Monument.**

A communication from Springfield, Ill., to the Chicago *Times* gives the following particulars of the bronze groups for the pedestal of the Lincoln monument:

It has already been reported that the two bronze groups designed to ornament the base of the National Lincoln monument have arrived here, and that they are to be placed in position at once. These two groups were designed by Larkin G. Meade, of Florence, Italy, who is also the architect of the monument, and who designed the statue of Lincoln, already described.

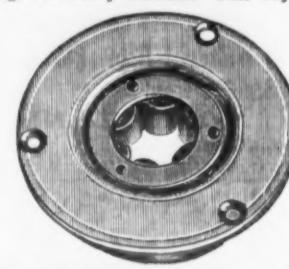
The groups were cast in bronze by the Chicopee Arms Company, of Massachusetts, and are said to be the most elaborate bronze castings ever executed in this country. They are now on the monument grounds, and have been so far stripped of their castings that a comparatively good view is to be had of them, and a really excellent idea of the spirit of the composition obtained. They have already been inspected by many members of the General Assembly and by hundreds of our citizens, and a brief description will probably be interesting.

The infantry group consists of three figures, the center of which is an officer garbed in the infantry uniform which was made historic by the war of the rebellion, but which has been discarded for a combination of dress, ornament and distinctive marks gathered from the Prussian and French armies and from the service of the late so-called Confederate States. This officer has seized the staff of the colors, which but a moment before had fallen to the ground, with which he leans on his arm. The pose of this central figure is very fine, and with the flag, which shines out, displaying its full glories, 16 feet high, makes the group pyramidal in form. On the left is a drummer boy with his drum, who has caught the excitement of the scene, and who rushes forward with a pistol in his right and drumstick in his left hand. On the right of the officer is the figure of a private soldier in infantry uniform, with knapsack and all accoutrements, in the act of charging with the bayonet. The features and arrangement of the dress of the soldier will represent those of the Western volunteer, and with a delicate taste

To L. Coes, Worcester, Mass.—March 13.—1.

The metallic handle E, formed of thin hollow sections or shells fitted to each other at their edges a a, and provided with offsets or shoulders b b at their ends.

2. The combination, with the bar A and fer-



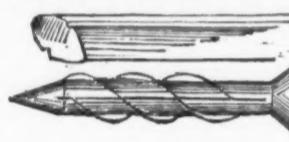
almost entirely overcome in this new bushing, which has not only a steel flange for the steel rollers, but steel rings and rivets. The metal used in the shell has stood a test of 25 tons to the square inch. These bushings are said to be more than twice as strong and durable as the ordinary brass bushings. H. B. Newhall, No. 11 Warren street, is the agent for these goods in this city.

**New Patents.**

We take the following abstract of new patents, recently issued, from the official record:

MANUFACTURE OF SCREW THREADED RODS.

To S. Vanstone and J. W. Hoard, Providence, R. I.—Jan. 30.—The improved method of making screw threaded rods, consisting in rolling the metal to a somewhat oval form, with grooves on two opposite sides, and then pass-



ing the same between the rolls having semi-cylindrical grooves that are obliquely scored or chased, said scores being such as to produce the spiral thread.

2. A screw or screw blank, having crescent shaped eccentric threads projecting from a cylindrical stock.

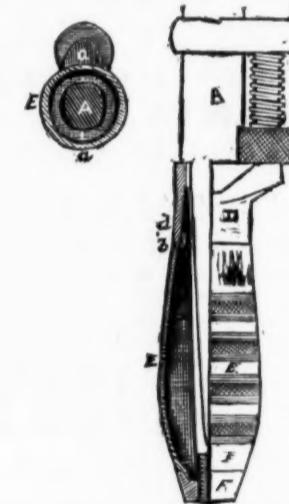
3. A continuous rod for screws or nails, rolled with raised threads thereon, alternating with cylindrical or unthreaded portions.

WRENCH.

To L. Coes, Worcester, Mass.—March 13.—1.

The metallic handle E, formed of thin hollow sections or shells fitted to each other at their edges a a, and provided with offsets or shoulders b b at their ends.

2. The combination, with the bar A and fer-



rule D, in a screw wrench, of the metal handle E, formed in two halves or sections, and having offsets or shoulders b b, and the flanged tip F.

186,768.—*Machine for Welding Metal Tubes.*—

S. P. M. Tasker, Philadelphia, Pa.—Jan. 30.

186,787.—*Electric Telegraphy.*—A. G. Bell, Boston, Mass.—Jan. 30.

186,820.—*Steam Trap and Boiler Feeder.*—E. Fox, Brooklyn, N. Y.—Jan. 30.

7484.—*Hollow Auger—Reissued.*—G. N. Stearns, Syracuse, N. Y. Patent No. 39,841, dated Sept. 3, 1863; reissued Jan. 16, 1863.—Jan. 30.

Different sizes of tenons are cut upon wagon or carriage spokes by means of a suitable cutter, longitudinally, vertically and laterally adjustable in a mortise in the upper outer part of an elongated metallic cylinder, through the lower part of which an adjustable stop and shank, formed in one piece, passes, and provided at its upper inner part with a large circular orifice, forming a bearing on the spoke as the auger cuts, and in which is secured one of a series of adjustable notched thimbles.

188,281.—*Pocket Knife.*—Farewell Bookner, Shilburn Falls, Mass.—March 13.

No back spring is used, but the blade is held open and shut by means of ridges on its pivoted end, which take into grooves in the sides of the case, which are formed of one and the same piece as the back.

188,306.—*Mode of Welding Bessemer Steel Rails.*—

Otto W. Meisenburg, St. Louis, Mo.—March 13.

The method herein described of welding Bessemer steel rails—that is to say, forming a pile of several of such rails, pieces of rail, or crop ends, without the admixture therewith of any other substance; heating said pile slowly and uniformly to the temperature, substantially, of 1200° centigrade; and then passing the same

through or between compressing rollers adapted

so as the requisite machinery can be arranged.

**The Miners of Tynewydd.**

Less than a month ago an incident occurred in one of the Welsh mining districts which stirred the great heart of the British nation to the profoundest depths of emotion. The story is briefly as follows:

On Wednesday evening, the 11th of April, as the men were on the point of leaving work in the Tynewydd mine, near Pontypridd, the roar of rushing water was heard and the galleries and tunnels suddenly began to fill. The water had broken through from an abandoned and flooded mine, and, of course, rose in the main shaft and the lateral workings until it found its level. Most of the men made their escape, but when the roll was called fourteen were missing. An exploring party went down to look for them. They found all the galleries within a few hundred yards of the bottom filled to the roof, but a knocking heard behind a wall

of coal indicated that some of the missing men were imprisoned alive in a gallery which sloped upward, its mouth being under water. The wall was a few yards thick. Volunteers went at it with their picks; the prisoners worked from within; in a few hours they could hear one another's voices.

But the moment a hole was broken through, the confined air, kept under great pressure by the rising water, burst out with a terrific explosion, and one of the imprisoned miners was shot into the opening as if he had been blown from a gun. He was taken out dead. Four others in the chamber with him were rescued uninjured. Knockings, however, were heard further on, and it appeared that other missing men were in a similar, but still worse predicament—shut into a chamber of compressed air. It is with the efforts to release this second party that the chief interest of the story begins.

The wall behind which they were confined was in a heading that was flooded, and nothing could be done with the pick until the water had been pumped out. Divers first attempted the perilous feat of reaching the opening from the main shaft through half a mile of water, and it was afterward ascertained that one of the men within had tried to escape in the same way. This, however, was impossible. It was not until Monday, the fifth day, that the volunteers were able to begin digging. The distance to be cut was 120 feet. The work went on day and night with an eagerness that seemed like desperation, and yet it was so slow! Cutting through the solid coal, in a gallery not more than three feet high, where the water, only kept down by constant pumping, threatened every moment to rise and engulf them, with trouble from gas and the danger of another explosion of air always before them, the rescue parties took their lives in their hand whenever they went into the mine, and their wives followed them with sad eyes as they entered the shaft, doubting if they would come up alive. And the hope of saving their comrades, shut up so long without food, was at best but a forlorn one. To reduce the danger from the sudden liberation of the air—danger not only of a violent explosion but of a sudden rise of the water in the chamber as soon as the pressure should be relieved—air-tight doors were constructed in the cutting, and an air-pump was set in operation to establish an equilibrium on both sides of the wall. On the 18th, a week after the accident, voices were heard, and the working party were cheered by a faint cry, "Keep to the right side, you are nearly through." On the 19th the work had made such progress that an iron tube was forced eight feet through the barrier of coal, and an attempt was made, but without success, to introduce milk through it to the famishing prisoners. The miners learned then that there were five of their comrades in the chamber, all alive, but two of them nearly exhausted.

On the night of the 19th there remained only 18 inches to be cut away, and the excitement rose to fever heat. An enormous assemblage of people surrounded the mouth of the mine; physicians were in readiness; a temporary hospital was prepared, and a house near-by was put in order for the sufferers, if baply they should be got out alive. The state of the work was discussed in Parliament, and bulletins were flashed at short intervals to the farthest ends of the kingdom. But just when it seemed that a few strokes of the pick might complete the labor, an eruption of gas took place, and the working party had to run for their lives. In time, however, the air was renewed and the work went on. At last, on the afternoon of Friday, the 20th, a hole was knocked in, and one of the cutting party entered the cavern. All was still; in their weak condition the agitation of the moment made the imprisoned men speechless. The rescuer felt about, and, not finding anyone, shouted, "Don't be afraid." The answer came, "All right; we are not afraid," and then a pair of rough arms were thrown about his neck. The first to be taken out was a boy named Hughes, and it is related that when the car came to the surface and the long suspense was over, the vast crowd of spectators "did not cheer, nor use any of the ordinary means of showing enthusiasm; all seemed too serious for that."

Cases of life preserved without food for ten days, and even longer, are not rare, though the period of abstinence which these Welsh miners endured is considered the longest which man is capable of sustaining under ordinary conditions. They were able to drink the dirty water in the mine, and water, it is well known, has a great influence in retarding the effects of starvation. They obtained a little sustenance also by sucking the grease that stuck to the bottoms of their candle boxes, but they ate nothing during the whole ten days. Still they retained so much strength that when the iron pipe was pushed through the wall and the water began to rise in consequence of the escape of the air, they were able promptly to plug up the aperture; and one of the men even wished to walk when he was taken out, but the doctors refused to let him. There was only one of the five about whose recovery any doubt was expressed at the date of our last advices. There are still four men to be accounted for out of the fourteen who failed to make their escape when the waters broke through, and these are undoubtedly drowned.

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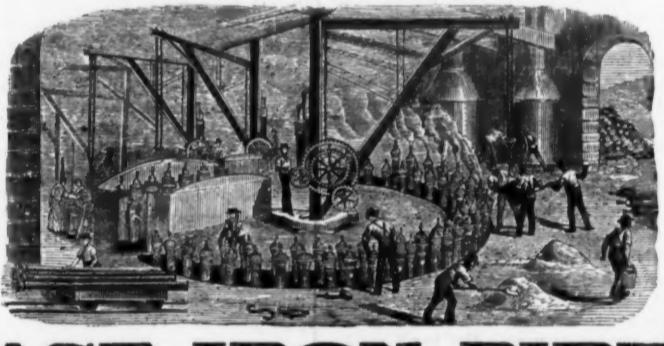
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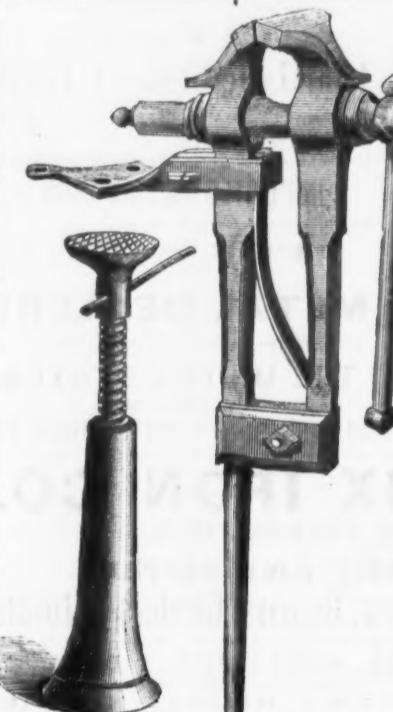
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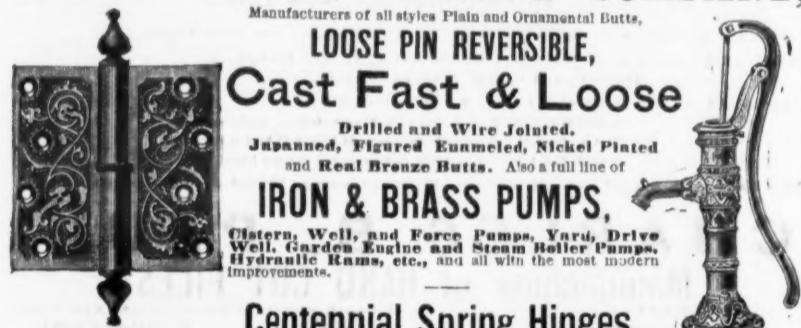
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The American File Company have the exclusive right to use the Bernot process for cutting files. By this method all the advantages of hand cutting are secured, together with an accuracy unattainable in hand work. They are the only manufacturers who employ machinery for testing files and steel.

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These FILES and RASPS are all Hand Cut and Warranted to do more work than any other brand in the market.

**AUBURN FILE WORKS,**  
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MADE FROM IMPORTED STEEL. EVERY FILE WARRANTED.  
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HAND CUT  
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Made from Best  
Quality Guaranteed by written warranty  
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**GOLD MEDAL  
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PATENTED JULY 25, 1871.  
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In this Strap the liability of the leather to stretch and become loose and porous is prevented by the use of a patented non-extensible base, which supports the leather and secures

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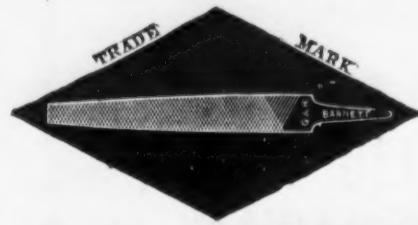
We make this style with single rod, double rod, and wood frames, and intend that it shall, in quality compare favorably with our other well known brands.

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**The Ausable Nails**

Are Hammered Hot,  
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Thus Imitating the Process of Making Nails by Hand.

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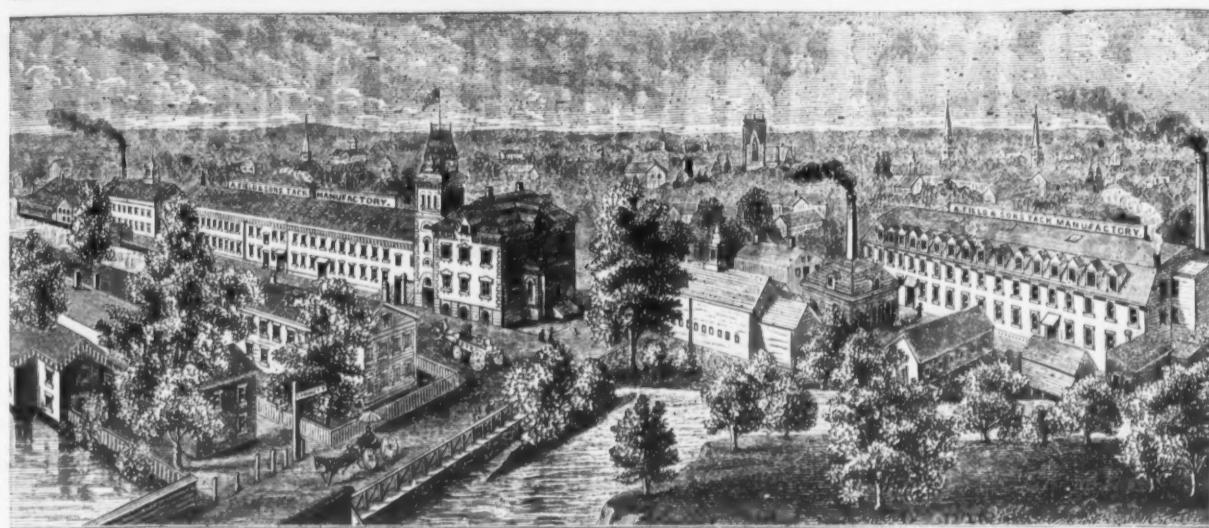
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**AXES**

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### American and Swedes Iron Shoe Nails.

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Five Two Penny & Three Penny Nails, Channel, Cigar Box & Chair Nails, Leathered Carpet Tacks, Glaziers' Points, Etc.

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Any variations from the regular size or shape of the above named goods made from samples, to order.

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Have a patented attachment for ascertaining the *tare* of a *dish* or other receptacle used in weighing without the use of weights or loss of time.

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Noiseless Self-Closing Revolving  
STEEL SHUTTERS,  
FIRE AND BURGLAR PROOF.

Also Improved

**Rolling Wood Shutters**

Of various kinds. Clark's Shutters are the **Best and Cheapest** in the world. Are fitted to new Tribune Building, Lenox Library, Delaware and Hudson Canal Co.'s Building, Transatlantic Steamship Co.'s new Dock, American News Office, &c., Penny County Court House, Mt. Vernon Hall, County Courthouse, Oregon, &c. Also to Buildings in Boston, Cincinnati, Detroit, Janesville, Wis., Baltimore, Canada, &c. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the **Leading Architects of the World.**

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PRINCE'S METALLIC PAINT,  
AN INDESTRUCTIBLE COATING FOR  
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PRINCE'S METALLIC PAINT CO.,  
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Caution.—As certain parties are offering for sale a **SPURIOUS PAINT**, under an imitation name, purchasers will please see that our TRADE-MARK is on every package. None other genuine.

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**FINE GRAY IRON CASTINGS** a specialty.  
Unsurpassed Facilities for Light Machine Work. Japanning  
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Prices low and quality of work as good as any made. Correspondence solicited.

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Factories,  
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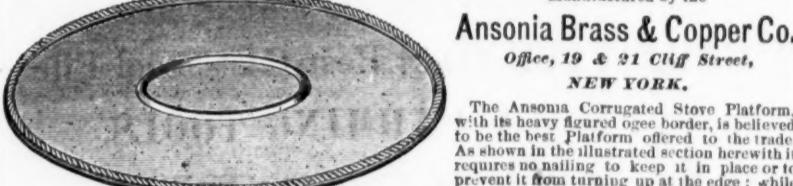
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No. 122, Fore Plane, 20 inches in length, 2 1/4 inch Cutter. \$2.25.

**ANSONIA CORRUGATED STOVE PLATFORM**

Manufactured by the

Ansonia Brass & Copper Co.  
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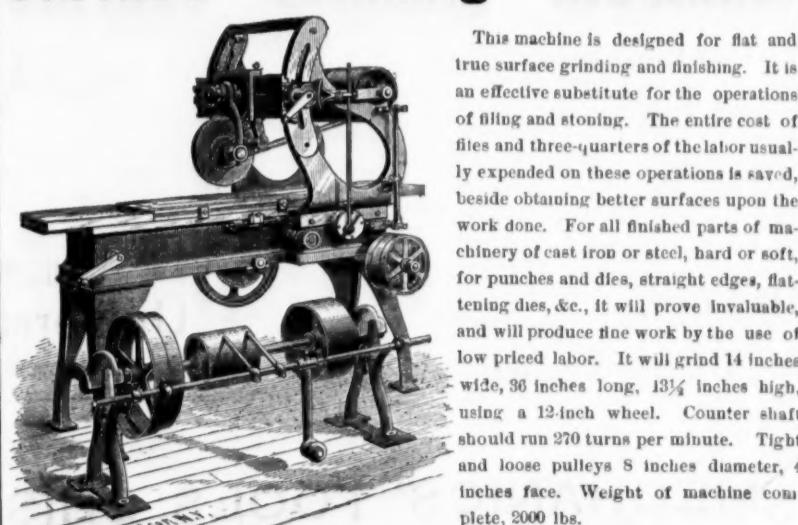


Cut Showing Round Platform.  
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The Ansonia Corrugated Stove Platform, with its heavy figured ogee border, is believed to be the best Platform offered to the trade. As shown in the illustrated section herewith it requires no nailing to keep it in place or to prevent it from turning up at the edge; while the metal is of sufficient thickness to require no lining.

The low price, superior quality and fine finish of this Platform will be readily acknowledged. Packed 100 in a case. Send for price list.

**Surface Grinding Machine.**



BROWN & SHARPE MFG. CO., Providence, R. I.

### Tool Steel Direct from the Ore.

Mr. Henry Larkin is now working at the establishment of the Red Moss Metal Company, Warrington, England, a direct process for the manufacture of tool steel from the ore. The results are said to be satisfactory. The process is described as follows in the *Bulletin of the Iron and Steel Association*:

His (the inventor's) first efforts dealt with magnetite iron sand, as it was a perfectly uniform material, free from any impurity that would be injurious to the steel which might be made from it. This ore he mixed with powdered charcoal in certain proportions, but, however, for commercial reasons chiefly, these iron sands were abandoned in favor of Marbella ores from Spain, which are crushed by passing the large and small lumps of the ore first through the jaws of one of Blake's machines, set as closely together at the bottom as practicable, the crushed material being sifted as it falls, and the coarser portion then passing through a disintegrator. The bulk of the ore is thus reduced to the condition of the iron sand.

The gangue, however, is crushed with the ore, and has to be separated from it so that a comparatively pure oxide of iron may be obtained. This is effected by an ingeniously contrived self-acting magnetic separating machine, specially devised by Mr. Larkin for the purpose. In this machine, which is capable of dealing with large quantities of material, the particles of magnetic oxide are picked up by magnetic attraction, contained in a pair of revolving drums, studded at intervals with horseshoe magnets, and carried into their proper receptacle, while the refuse is deposited in another.

Having got the ore pure, it is mixed with a sufficient quantity of powdered carbonaceous matter to combine with the oxygen of the ore, and thus effect its reduction. The carbonaceous matter consists of powdered charcoal and powdered resin, or other suitable bituminous substance, the two being reckoned together somewhat in excess of the oxygen to be removed. The mixture is then slightly warmed and compressed into bricks ready for the reducing furnace, which consists of a series of  $\Delta$  shaped gas retorts with doors at each end. The retorts are heated upon the principle of the Siemens gas producer. The burning gases from the fire are also made to completely envelop the retorts, and air holes are opened at regular intervals in order to complete combustion.

In charging the furnace, the door is removed from the feeding end of the retort, and a small stack of prepared bricks is packed on a rectangular iron plate and pushed into the further end by means of an iron rod. The plate is then withdrawn, leaving the stack securely placed. A second and a third feeding follow, which fill the retort. The door is closed, and the retort is subjected to a pretty full red heat for about twenty-four hours, when the carbonaceous matter is practically consumed, and the oxide of iron becomes converted into red-hot iron powder. The charge is now ready for removal, and the door at the other end of the retort is opened, and an iron receiver brought closely under the projecting end-piece and securely supported there, ordinary coal gas being blown upon it to keep up the heat. Gas is then let into the inside of the feeding end of the retort, when the door of that end is quickly removed, and a temporary door with a wide slot half way down the middle of it is put in its place. The slot is for the introduction and working of the discharging tools, by which the red-hot powder is quickly pushed forward into the receiver at the discharging end.

As soon as the retort is empty the gas at both ends is turned off, and the iron receiver containing the metallic powder is removed and kept carefully closed until its contents are cool. When the metallic powder is sufficiently cooled down, and no injury will arise from its exposure, it is turned out of the receiver and again passed through the disintegrator and the magnetic machine for a final purification. Thus pure metallic powder is produced.

This process has been carried out very successfully by the Red Moss Metal Company, in a commercial as well as experimental point of view. To produce tool steel they mix with the metallic powder, beside some small percentage of flux, whatever additional amount of carbon may be needed, chiefly in the form of resin. This resin easily makes it possible to compress the finished powder into small cakes in the same way as the bricks of ore and charcoal were compressed in the first instance. The cakes of finished material are then stacked up, ready to be melted in crucibles in the usual way with the addition of manganese or any other alloy that may be found advantageous.

**American Railroad Equipment for Russia.**—It is stated on good authority, that the report lately current in this city, to the effect that the Russian government had prohibited the importation of railroad cars and locomotives, has no foundation in fact. Mr. Krawjewski, the agent of the Boards of Agriculture, of Southern Russia, who is purchasing agricultural tools for the boards in this country, is also in communication with Russian railroad companies, and is acting for them in the purchase of car wheels, switches and railroad material. If any decree of the character mentioned had been issued, it is probable that the fact would have been telegraphed to this city. No telegram has been received. On the contrary, orders have been received for railroad material. Two years ago a large company was being organized in Russia for the manufacture of locomotives. It is supposed that some decree may have been made for the protection and benefit of this company, but Mr. Krawjewski does not believe that importations have been prohibited, and he hopes yet to send American locomotives to Russia himself.

### Welding Cast Iron and Steel.

The London *Mining Journal* has the following in regard to a German method of uniting cast iron to steel:

Messrs. Asbeck, Osthans, Eicken, of Hagen, Westphalia, manufacture a mass consisting partly of steel and partly of iron, and which they call steel iron. The novelty, if any, consists in introducing a thin plate of iron at the junction. A chill of cast iron is divided into two compartments, either by a transverse plate, or by standing a tube within it, and the metals to be united are poured into the separate compartments. Previous to fusion both metals are refined and purified from all substances pernicious to their welding, after which the steel in fusion, as also the soft iron in fusion, are at the same time and in similar proportions poured into the divided chill, in which the dividing plate of sheet iron welds both the steel and iron so intimately together that they form a perfect union, the sheet iron serving at the same time not only as a preservative against mixing of the two metals, but also as a means of their welding. The success of the proceeding depends greatly upon the careful and peculiar preparation of the materials, and upon their quality and fitness for welding, as also upon the thickness of the sheet iron plate, which must be sufficiently thick to resist the burning influences of the metals in fusion, and yet not too thick, otherwise the materials in fusion during their rising in the chill will not bring the plate to welding. The requisite thickness of the sheet iron is determined by experience, and the dimensions differ naturally in proportion to the transverse cut of the different blocks to be made. The steel and iron are placed on one or other side of the dividing sheet or tube, according to the purposes for which the mass is required. The combination is said to be applicable to various purposes; for instance, that it will be advantageous to employ steel welded to iron for rails, anvils and armor plates, as the hard steel will diminish the wearing; and armor plates for safes, to render them burglar-proof, when made of this improved material, will, owing to the steel therein, resist the hardest drill, while at the same time the iron preserves such plates from all danger of fracture from blows. All such parts of machinery or tools as have either to resist or to produce a strong pressure or strong concussion, such as rollers or axles, are with great advantage made of this improved material, which combines great internal tenacity with external hardness. The wear of the external material is reduced to a minimum, while its internal softness gives it considerable tenacity and prevents breaking.

**Dealing With Riotous Strikers.**—Advices from Rondout N. Y., under date of the 3d inst., report as follows: The men employed at the works of the Anthracite Fuel Company, at Port Ewen, who were receiving \$112 per day, struck on Monday last. The company obtained new men and commenced work yesterday, when the strikers stoned the men and threatened their lives. They also visited the works and tried to obtain the names of the men at work, but they were ordered away. Several of the strikers were very demonstrative in their actions, and the superintendent of the company determined to put a stop to the intimidation. Judge Westbrook was applied to for warrants for the ringleaders and Sheriff Webb detailed four deputies to make the arrests. They visited Port Ewen last night and arrested Edward McDonald, Patrick J. Grady, Peter Mack, James Wright and Thomas Taylor, taking some of them from their beds. Thomas J. Murray was also arrested this morning, and the Sheriff is still after others. The prisoners were examined this afternoon and bound over to await the action of the Grand Jury. Judge Westbrook in his remarks to the prisoners was very severe upon the spirit of lawlessness which has been rampant in this community so long, and gave public and private notice that so far as he could reach it he would put an end to it. He told the men very impressively that the crime with which they were charged was far more serious and could be punished with far greater severity than ordinary crimes against person. The proceedings have caused considerable excitement and comment here, as it is the first case in a long time in which this class of disturbers of the peace have been dealt with summarily, and business enterprises and the community have been in a large measure at the mercy of their insolent demands.

**The Blackwell's Island Bridge.**—The plans of the New York and Long Island bridge, which were adopted by the directors, have not yet been completed, and the original design is being modified so as to reduce the estimated cost about \$300,000. This modification is under the direction of Oscar Chanute, of the Erie Railway. As soon as the modified plans are finished the directors will hold a conference with Wm. H. Vanderbilt and the Messrs. Poppenhusen, of the Long Island railroads, for the purpose of ascertaining in what way they are willing to encourage the enterprise, as it is considered that the bridge, by means of the connecting railroad over it, will directly enhance the value of the Vanderbilts and Poppenhusen railroads. Commodore Vanderbilt favored the building of a bridge across Blackwell's Island, and the directors of the Long Island bridge have a letter from Wm. H. Vanderbilt, stating that he will carry out his father's ideas in reference to it. The next question which will shortly engage the attention of the directors will be the raising of sufficient funds. At present there is only \$70,000 subscribed, and it is desired to have \$500,000, or one-third of the cost, before beginning active work. It is hoped that many of the land owners on Long Island, whose property will be benefited by it, will purchase stock, and also that many wealthy persons in New York who favor rapid transit communication between the upper portion of the city and Brooklyn will become subscribers. A meeting of the directors will be held this week, at which an engineer of the work will be appointed and other business discussed.

# RUSSELL & ERWIN MANUFACTURING COMPANY

## Manufacturers of HARDWARE.

FACTORIES, - - - - NEW BRITAIN, CONNECTICUT, U. S. A.

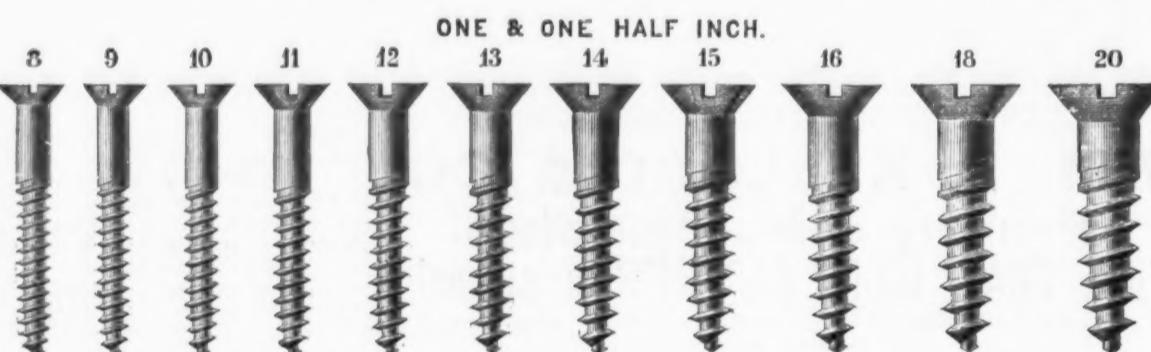
MANUFACTURERS' AGENTS AND DEALERS IN GENERAL HARDWARE AT OUR

WAREHOUSES: NEW YORK, 45 & 47 Chambers St.; PHILADELPHIA, 425 Market St.; SOUTHERN DEPARTMENT, BALTIMORE, MD., WM. H. COLE. Agent, 17 S. Charles St.

# R. & E. MFG. CO.

Our very large daily production embraces all sizes from 1-4 inch to 4 inches in length.

All orders will be filled promptly.



Our Screws are packed in our new Patent Paper Boxes, bearing our labels, on which are LARGE FIGURES denoting the size and number.

We have nearly ready for distribution a large Illustrated Catalogue and Price List of our goods. It will be called **VOLUME 4**, and will take the place of Volume 1, 1874. It will contain a complete list of all goods of our manufacture (except Bronze Hardware), consisting of **DOOR LOCKS, KNOBS, ESCUTCHEONS, &c., PADLOCKS, CABINET LOCKS, MISCELLANEOUS HARDWARE** and **SCREWS**.

**VOLUME 2** and appendixes to same contain a large and complete line of **REAL BRONZE BUILDERS' HARDWARE, NICKEL-PLATED, NICKEL & GOLD, ANTIQUE AND ILLUMINATED**.

**VOLUME 3**, 1875, with additional pages, contains a full line of **GENERAL HARDWARE**, which we offer as Manufacturers' Agents, or at Factory Prices, containing in part:

**RUSSELL, BURDSALL & WARD'S** Carriage, Tire, Plow and Stove Bolts.

**JUDD & BLAKESLEE'S** Wrought Brass Butts, Window Spring Bolts, Sash Fasteners, &c.

**UNION MANUFACTURING CO.'S** Drilled Cast Butts in all styles.

**THOS. JOWITT & SONS'** and **NICHOLSON FILE CO.'S** Best Cast Steel Files.

**O. AMES & SONS'** Shovels, Spades, &c., &c. **IOWA FARMING TOOLS**.

**AUSABLE, GLOBE, VULCAN, PUTNAM** and **CLINTON** Horse Nails.

**AMERICAN** and **UNION** Spring Hinges, single and double acting.

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**TORREY'S, GEM, CHALLENGE** and **STAR** Door Springs.

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**GIRARD** Wrenches. **SPOFFORD'S** Braces.

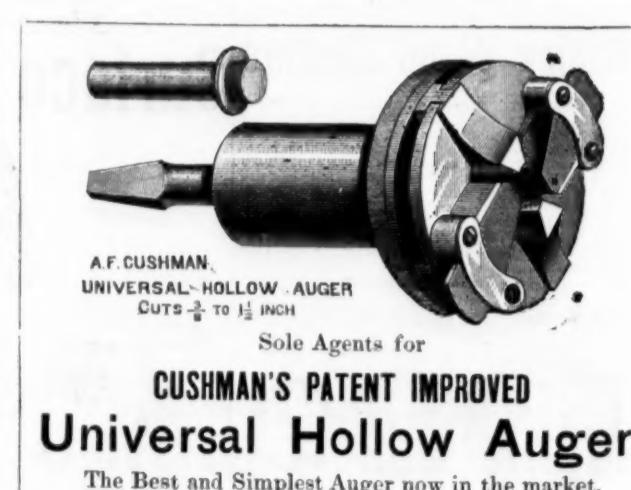
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**CHARTER OAK** Lawn Mowers.

We also have a complete assortment of **MECHANICS' TOOLS, CHISELS, DRAWING KNIVES, AUGERS, BITS, BORING MACHINES, &c.**



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Manufacturers of PEN AND POCKET CUTLERY.

Solid Steel Scissors, Shears, Razors,  
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Sole proprietors of the renowned full concave patent



"ELECTRIC RAZORS,"

And the "ELECTRIC SHEARS." Nickel Plated  
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91 Chambers and 73 Reade Sts., N. Y. 423 N. Fifth St., ST. LOUIS, MO.

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MANUFACTURE ALL KINDS OF TABLE CUTLERY.

Exclusive Makers of the "PATENT IVORY" or Celluloid Knife, the most durable WHITE HANDLE known. The Oldest Manufacturers in America. Original Makers of the HARD RUBBER HANDLE. Manufactured for the Meriden Cutlery Co., the sole proprietors, and sold by all Dealers in Cutlery, and by the MERIDEN CUTLERY CO., 49 Chambers Street, New York.



## THE MILLER BROTHERS CUTLERY CO.,

Manufacturers of PATENT FINE PEN & POCKET CUTLERY  
WEST MERIDEN, CONN.

The only Knives made that are put together in such a manner that there is no strain on the covering or frail part of the knife. We warrant our knives equal in cutting qualities and workmanship to any other knife. Orders filled from the factory, and in New York by Messrs. J. Clark Wilson &amp; Co., No. 81 Beekman Street (who have a full stock of all patterns always on hand), and also by Messrs. G. B. Walbridge &amp; Co., No. 99 Chambers Street.

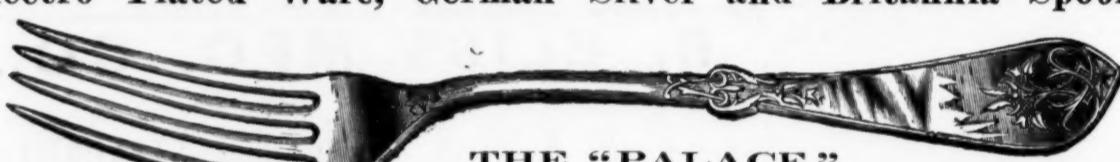
NICKEL &amp; SILVER PLATED POCKET KNIVES

which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal to any other knife. Orders filled from the factory, and in New York by Messrs. J. Clark Wilson &amp; Co., No. 81 Beekman Street (who have a full stock of all patterns always on hand), and also by Messrs. G. B. Walbridge &amp; Co., No. 99 Chambers Street.

NAUGATUCK CUTLERY CO.,  
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1876FRARY CUTLERY CO.  
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1876

The above Illustrations represent their New Patent Screw Tang Lock Solid Handle Knife.

There is no question but that a solid handle knife is much more preferable than a scale tang. The great objection to their use hitherto is, that no solid wood handle has been placed on the market with the handle properly secured—no handle put on with cement will stand the wear and tear of every day usage. The cement will expand and contract with the action of heat and cold, and become loose, crack and come off, causing great prejudice against their use. This objection is overcome in our patent screw tang. A wood screw is welded to the tang of the knife or fork, and screwed firmly and securely in the handle and locked there by the boister, making a very strong neat and handsome knife, which we warrant never to get loose, crack or come off. We manufacture a large variety of patterns, both Table, Butchers and Carvers, and furnish the patent handle nearly as low as the scale tang. We are prepared to furnish this line of goods, together with the scale tang and iron handle, very promptly, and very respectfully invite the attention of the trade.

## THE ROGERS CUTLERY CO.



MANUFACTURERS OF

## Cutlery &amp; Silver Plated Goods.

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(HARTFORD, CONN.)

## COIL CHAIN.

Agricultural Chain,  
Wagon Chain.We furnish a better article for less money than  
any concern in the country.  
Union Chain & Cable Co.,  
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## Cutlery.

## ESTABLISHED 1852.

## NEW YORK KNIFE CO.

MANUFACTURERS OF SUPERIOR

## Table &amp; Pocket Cutlery,

WARRANTED TO BE MADE OF THE BEST  
MATERIAL.WALKILL RIVER WORKS,  
Walden, Orange Co., New York.  
THOS. J. BRADLEY, President.

THOS. J. BRADLEY, President.

Corporate Mark.

NO SPENCER  
ROTHERHAM

Corporate Mark.

Granted 1777.

F. W. HARROLD,  
Birmingham and Sheffield,  
ENGLAND.

Importer on Commission

of HARDWARE, CUTLERY, GUNS, &amp;c.

W. SANDERS, Agent,

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CORPORATE MARK,  
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(LIMITED)

## CELEBRATED CUTLERY,

No. 82 Chambers Street, New York.

F. &amp; W. CLATWORTHY, Agents.

The demand for Joseph Rodgers &amp; Sons' products having considerably increased, they have, in order to meet it, greatly extended their Manufacturing Premises and Steam power.

To distinguish Articles of Joseph Rodgers &amp; Sons' Manufacture, please see that they bear their Corporate Mark.

## VAN WART, SON &amp; CO.

Hardware Commission Merchants,  
EXPORTERS AND IMPORTERS,  
BIRMINGHAM, - ENGLAND.

Agents,

## McCoy &amp; COMPANY,

134 &amp; 136 Duane Street, N. Y.

George H. Gray & Danforth,  
48 India Street, Boston.

F. W. TILTON,

17 Old Lever Street, New Orleans.

At each of these places a complete assortment of samples of Hardware and Fancy Goods will be found, including all new descriptions. Sole Agents for

John Rimmer &amp; Son's Celebrated Harness and other Needles.

W. Clark's Genuine Horse Clippers.

Seydel's "Ashante" Pocket Hammock

McCoy &amp; COMPANY,

BORAX A SPECIALTY,

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OWEN &amp; CAMPBELL,

Manufacturers of

## Pen and Pocket Cutlery.

All blades forged from the best English Cast Steel and warranted. Each knife is made in the most substantial manner, all articles being of the best quality. Orders filled from the Factory.

10th &amp; Diamond Sts., Philadelphia.

ALFRED H. HILDICK,

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Birmingham Heavy Hardware, Chains,

Anvils, Files, &amp;c.

Agency of HILL BROS. &amp; CO., WALSALL, ENGLAND,

GENERAL HARDWARE MERCHANTS,

And of

Ball's Pat. Solid Steel Sheep Shears.

These shears are unsurpassed for cheapness, durability and utility. They are made of one solid piece of steel from point to point, and cannot be broken in use, either in the bow or at the junction of stock and blade. Samples can be seen at above address, or sample lots furnished. Dressed in "THE UNION" SOLID BOX VISES. A cheap and excellent Vise.

## CARSON'S PATENT KITCHEN SINK.

"The Kitchen Sink heads the list by which people violate the universal Sanitary Law," G. E. Waring, Jr.

The above Cut represents the CARSON SPK, an Article which combines Two very important features in Domestic Economy. It presents the pipe for cleaning and at the same time furnishes grease enough to make soap for the Family and is perfectly odorless.

Health and Economy are its main features of excellence. Send for Circular and Prices.

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Crane's "76" Potato Masher.

Efficient, durable, and easily cleaned. Supplied to the trade only. Samples sent free to responsible houses. Agents wanted in every State. Send for illustrated circulars and price list to

ROBERT CRANE, Jr., Columbia, Lancaster Co., Pa.

## Expiration of the Last Important Sewing Machine Patents.

On Tuesday of this week the last of the patents covering essential features of the sewing machine expired. For many years past a combination of large manufacturers—viz., the Singer Manufacturing Company, the Wheeler &amp; Wilson Company and the Grover &amp; Baker Manufacturing Company—have bought up and controlled inventors' patents, and, concentrating their rights, have been enabled to restrict such general manufacture as would interfere with their business. One of the most important of their patents was the old Howe patent for an eye-pointed needle, a shuttle, and other mechanical devices for sewing, which, however, expired nearly ten years ago. Another patent was for the four-motion feed, which was invented by Allen B. Wilson and patented in the name of one Fitzgerald, and was known as the Fitzgerald patent. This also expired three years or more ago, and was likewise a relief to the outside manufacturers, who had for many years paid a royalty for its use, as it was an essential in every machine.

The last patent which they held, and the one which expired last Tuesday, is known as the Batchelder patent, granted in 1856 and renewed in 1870, and covered what is known as the needle plate, an essential in every machine. The needle plate is the small piece beneath and through which passes the needle to connect with the shuttle. The patent really covers all styles of feeding devices in which the cloth is fed between two clamping surfaces. For the privilege of using this article on their machines all companies outside of the combination have been obliged to pay a royalty of \$3 on every machine sold, except those which are intended for exportation. They have complained loudly about this tax upon them and hail its expiration with unconcealed delight. One company display an account showing that they had paid during the last ten years the sum of \$800,000 as royalty to the companies controlling this patent. All these manufacturers have been obliged to keep a record of the plate number of every machine sold, and make oath to the accuracy of their royalty statements, a thing which appears simple enough, but which they say has caused them untold annoyance in the way of having machines returned to them, exchanged, and other like transactions, for which they have been held to a rigorous account, at much time and expense. There are, of course, a great number of patents relating to the sewing machine still good, but they relate to improvements of minor importance, which need not be employed in making a first-class machine. How the trade will be affected by the change is still uncertain.

## The Block System.

Considering its uncertainties, and the fact that its value is, at most, doubtful, the block system is rather costly. The Great Northern Railway Company, of England, which has about 600 miles of line, has made the following expenditures in connection with the block telegraph system and interlocking apparatus during the past seven years:

1870	\$5,750
1871	41,210
1872	36,935
1873	89,325
1874	379,235
1875	455,930
1876	390,235

Total ..... \$1,388,620

This makes the total expenditure for the appliances of the system at the rate of about \$2370 per mile of road, and whether it is fully introduced throughout the company's system does not appear, but likely it is not, for some parts of the line probably have not so heavy a traffic as to require it. The above amounts are simply the capital invested in the improvements. Last year there was an expenditure for maintenance and renewals amounting to \$31,130, and one for additional signal men amounting to \$127,150. If we reckon 7 per cent. interest on the capital invested (5 per cent. is sufficient there, but 7 is none too much for the average American company), we have a total annual expenditure chargeable to the improvements of \$255,480, or \$437 per mile of road. We see no estimate, however, of the economy effected by the use of the block system, and there must be some considerable savings which should be set against the expenses stated above. It is said that on the London and Northwestern, which has now more than 1000 miles worked on the absolute block system, the additional cost of the new over the old system is between \$1,000,000 and \$1,500,000 per year.

A New Labor Movement.—A society called the Workingmen's Press Association was incorporated in St. Louis on the 2d inst. The association is to be under the control of the St. Louis section of the Workingmen's Party of the United States, and its objects are the promotion of literature and science among the working class of that city and elsewhere, and the publication of a newspaper to be called *Volks Stimme des Westens* (the voice of the people of the West), which is to represent the tendencies of social democracy and watch the interests and rights of the working classes. As a business venture the undertaking does not promise much.

A Japanese Iron-Clad.—An iron-clad man-of-war, built by Messrs. Samuda, at Poplar, from the designs of Mr. Reed, member of Parliament, was launched April 14. The Japanese Minister was present, and the ship was named the Foo-So by his wife, after the well known mountain in Japan. The vessel, which has nine inches of armor and a ram, is 230 feet in length, and will, it is estimated, have a speed of 13 knots an hour. The Chinese Minister was present, and he proposed the toast of "success to the navy of Japan," adding that he hoped it would never fire a shot, except as an ally to China.

AMERICAN  
BOLT & NUT WORKS,  
Cincinnati.

# L. M. DAYTON,

CINCINNATI, O.

Bar Iron,	Carriage Bolts,	Plow Bolts,
Sheet Iron,	Tire Bolts,	Hot Pressed Nuts,
Horse Shoe Iron,	Machine Bolts,	Washers.

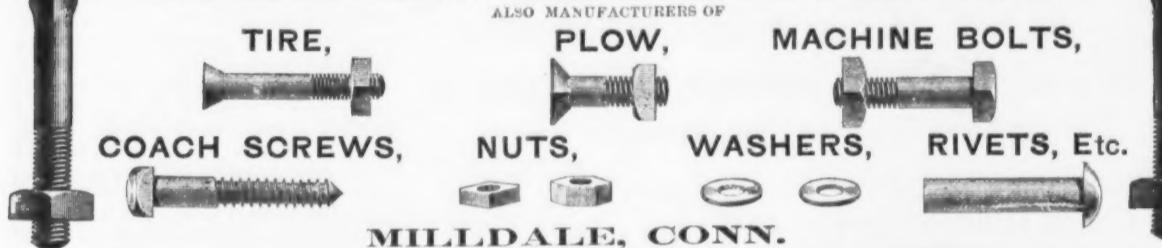
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## CLARK BROTHERS & CO.,

SOLE MANUFACTURERS OF

### Clark's Patent Concave Carriage Bolt.

Best Bolt manufactured for all kinds of Agricultural Machinery. Will not split the wood, and cannot turn in its place.



MILLDALE, CONN.

## COLEMAN EAGLE BOLT WORKS.

(ESTABLISHED 1845.)

The Original and Only Establishment Manufacturing the  
Genuine Coleman Eagle Bolt.

Made of Best Quality

SQUARE NORWAY IR. N.

## WELSH & LEA,

Successors to M. J. COLEMAN.

WORKS, Columbia Avenue, Hancock and Mascher Sts.,  
OFFICE, 145 Columbia Avenue (Late 2030 Tech St.),  
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C. R. MOON & CO.,  
Dealers of  
WROUGHT IRON HARDWARE SPECIALTIES FOR WAGONS,  
And all kinds of CARRIAGE AND WAGON MALLEABLES.  
Also Manufacturers of  
MOON'S IMPROVED NECK YOKE.  
The Best and Cheapest in the market.  
C. R. MOON & CO., 103 Scranton Ave.

Send for Catalogue.  
Correspondence solicited.  
CLEVELAND, OHIO.

J. BARKER,  
Successor to W. C. BARKER & CO.,  
Iron, Steel, Nails,  
HEAVY HARDWARE, WAGON AND CARRIAGE MATERIAL, DRILLS,  
ANVILS, BELLows, VISES, CHAINS, &c.  
CHICAGO, ILLS.

## TOWER'S PATENT Double Shovel Plow.



Combines more good points than any other; adjustable handles; depth perfectly regulated from end of beam; adjustable foot; shares can be drawn down till worn out; a perfect BREAK PIN, by substituting wood pins for either at the foot bolts.

Write for prices and discounts. Freight equalized to all important places.

J. & S. BONES & CO., Manufacturers,  
ROME, GA.

MILL,  
Anchor Iron & Steel Works,  
Newport, Ky.

## Philadelphia "STAR" Bolt Works.

NORWAY IRON  
Carriage & Tire Bolts. Star Axle Clips, &c.  
TOWNSEND, WILSON & HUBBARD, 2301 Cherry St., Philadelphia, Pa.

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### "Keystone" Boiler Rivets, BRIDGE & SHIP RIVETS.



#### TURNED MACHINE SCREWS,

One-sixteenth to five-eighths diameter.  
Heads and points to sample.  
IRON, STEEL and BRASS.

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Manufacturer of  
Boiler Rivets, Bolts, Railroad  
and Boat Spikes, &c.

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FOR THE LEAST MONEY OF THE

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Send for Prices and Sample Lot.

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FRANKLIN S. MILES,  
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Brass, Iron, Steel and German Silver  
SCREWS.  
205 Quarry Street, Philadelphia.



THE CHICAGO SCREW CO.  
FINE MACHINE, CAP AND SET  
SCREWS  
SEND FOR PRICE LIST  
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R. COOK & SONS,  
Manufacturers of  
Carriage & Wagon AXLES,  
WINSTED, CONN.  
ESTABLISHED 1839.

A Superior Quality of  
SCREW BOLTS,  
Lag Screws, Tap Bolts,  
Set Screws, Bolt Ends, Turn Buckles,  
&c. Manufactured by  
SAMUEL HALL'S SON,  
Established 1839. 229 W. 10th Street, N. Y.

J. Billerbeck & Co.,  
KEYSTONE SCREW CO.,  
Manufacturers of  
IRON GIMLET - POINTED WOOD  
SCREWS.  
17th & Venango Sts. Philadelphia.

Tackle Blocks  
Or all Description.  
SHIP BLOCKS,  
Well and Ships' PUMPS.  
PATENT Pressed  
PUMP LEATHERS.  
Dealer in LICNUMVITÆ WOOD.  
JOSEPH THOMPSON,  
Factory, 36 Burling Slip, S6 South St., N. Y.



## FORT PLAIN SPRING AND AXLE WORKS.



#### FOR SPRING TRADE.

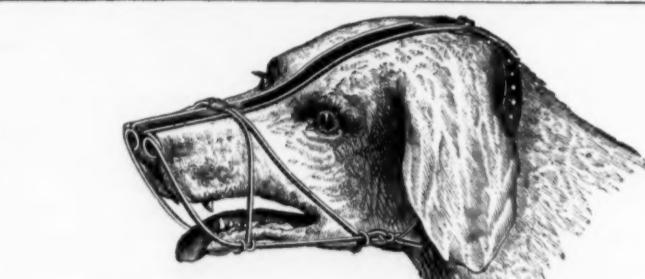
All dealers in SPRINGS AND AXLES will find it to their interest to send to us for  
Price List and Discounts.

WOOD, SMITH & CO., Fort Plain, N. Y.

## R. BLISS MFG. CO., PAWTUCKET, R. I.

MANUFACTURERS OF  
STANDARD CROQUET.

This cut represents a Full  
Set of our No. 4 Croquet.  
The Mallets are made from  
New and Attractive Designs.  
The Balls in all our games are  
perfectly round, being turned  
by machinery patented and  
owned exclusively by us, and  
the goods throughout are the  
best that can be made from  
the choice Mountain Timber of New England.



The accompanying cut represents our

## NEW SAFETY MUZZLE,

which is not surpassed by any in the market for Safety, Beauty and Durability. List, \$3 per doz.  
A large stock now on hand, together with a full assortment of Leather and Metal Dog Collars, to  
which we have just added a new style of Nickel Plated Chain Collar, as shown herewith.



No. 60, assorted, 9, 11, 13 and 15 inches, list, \$2.50 per doz.; No. 65, assorted, 14, 16, 18 and 20 inches,  
XL pattern and cheaper grades.

UNION HARDWARE CO., 120 Chambers St., New York.



# The Iron Age.

New York, Thursday, May 10, 1877.

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JAMES C. BAYLES . . . . . Editor.  
JOHN S. KING . . . . . Business Manager.

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77 Fourth Avenue, Pittsburgh.  
JOS. D. WEEKS, Manager and Associate Editor.

PHILADELPHIA OFFICE.  
220 South Fourth Street.  
THOS. HOBSON, Manager.

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AUSTRALIAN AGENCY.  
The American Hardware Company are our agents for Australia. They will exhibit files of *The Iron Age* in the American Building of the International Exhibition, at Sidney, N. S. W., where subscriptions will be received. After the close of the Exhibition, the files may be examined at, and orders for subscription directed to, their office in Melbourne. Sample copies will be mailed to them, free of charge, to any firm engaged in the trades we represent in Australia, Tasmania and New Zealand.

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Forty-first Page.—Cincinnati, Boston and St. Louis Hardware and Metal Prices.

## The Perversion of Capital.

Dr. Wirth, of Vienna, the eminent German statistician, has compiled a table of great interest, which, if the figures are even approximately correct, gives us some idea of the enormous drains upon the world's accumulations of capital for "purposes of government." The following is the

ernment purposes add comparatively little to the wealth of nations or their productive resources, and that wars and war preparations consume always wastefully and always unprofitably the labor of millions, there is good reason to speak of the diversion of capital from private investments into public treasures as a perversion, resulting in endless mischief. When people are tired of paying for wars, kings and congresses will have recourse to other and more economical methods of settling their differences than by appealing to the sword; and the productive energies of nations will not be crippled as they now are by the withdrawal of so much labor from the useful industries to maintain great military and naval establishments.

## The Position of Tin Plates.

For the past twelve months tin plate manufacturers in England have been working at a loss, which has resulted in the stoppage of several works, and in the failure of others. Meanwhile iron, such as is used for tin plates, has not declined, and block tin, as well as other articles entering into their manufacture, have remained about the same as they were a year ago. But the stagnation of the world's trade has been so persistent that, in common with most manufactured articles, plates have declined to unprecedentedly low figures.

Value of Ordinary Brands at New York.

	April 28, 1876.	May 5, 1877.
Gold, per box.	Gold, per box.	Gold, per box.
Charcoal Bright. \$7.00	6.75 to 7.25	6.92 to 7.25
Charcoal Terne. 6.75 to 7.00	5.875 to 6.00	5.75 to 6.00
Coke Tin. 6.125 to 6.75	5.75 to 6.00	5.375 to 5.50
Average. \$9.98	\$5.97	\$5.97

The decline in this market in about three years has therefore been 32 per cent. Nor need we look for much of an improvement, at least in Europe, while the political horizon remains clouded as it is at present. If the nations now at war have not been large consumers of tin plates, they have been so to some extent, and in the immediate future will take considerably less.

Ours is, indeed, about the only country beside the British colonies where a revival may be looked forward to. Expecting such a revival in the United States for some time past, the shipments this way since 1872 have been, up to the commencement of last year, steadily on the increase. Since then they have fallen off.

## Export of Tin Plates from England.

	1872.	1873.
To the United States	1,531,356	1,811,632
To other countries	552,095	638,845
Total	2,083,451	2,160,477

	1874.	1875.
To the United States	1,585,994	1,696,485
To other countries	537,474	775,551

	1876.	1877.
To the United States	1,609,515	775,551
To other countries	790,523	399,691

	1876.	1877.
Total	2,400,098	2,400,098

## Total Shipments in Tons During the First Quarter.

	1876.	1877.
Tons.	Tons.	Tons.

	1876.	1877.
34,117	30,960	37,242

	1876.	1877.
34,872	37,242	34,872

	1876.	1877.
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34,872	37,242	34,872

	1876.	1877.
34,872	37,242	34,872

headquarters and strength of the unions, and any contest that is decisive must be fought there.

#### A Disabled Ocean Steamer.

During the present week a Cunard steamer brought to this country the news that the boiler of an ocean steamer, the Sidonian, had exploded in mid-ocean, killing seven men at once and scalding one fatally, who died the next day. If we remember rightly, this is the first boiler explosion that we have ever heard of that took place upon an ocean steamer at sea. From the account we judge that an expansion eccentric slipped on the shaft, and while the engine was stopped to repair it the boiler exploded. The steamer was only used for freight, and consequently there were no passengers to be injured. It is a cause of remark among some of the engineers who have expressed opinions upon this subject, that, if the boilers really exploded, the ship's bottom was not stove and the vessel sunk at once. It is certainly a suggestive case, and from it another theory may be formed to account for the loss of some of the numerous steamers which are counted among the "never-heard-from." Boiler explosions may have contributed their share to swell this list. In case of a breakdown, necessitating a stoppage of the engine for a considerable time, the water in the boilers would have time to become so hot in all parts as to be ready to make steam throughout its mass whenever the pressure was lowered by starting the engine or opening the throttle. In such cases the bursting of the boiler is very probable, as has been shown by Williams and others. Upon river and coast steamers explosions under such circumstances have been very common, and we are under the impression that the majority of explosions of large boilers have taken place under similar conditions. The verdict in the case of such boiler explosions is almost invariably low water. Among a great number of people the idea that a boiler may explode without low water or over pressure seems absurd, but for all that explosions often occur without overpressure or low water. Probably upon the ocean the danger from the bursting of boilers is much less than upon the land, because of the better class of men employed as marine engineers, and their greater responsibility.

The trade union, a fungus growth developed in times of general prosperity, does not thrive in times of depression when the supply of labor exceeds the demand for it. Among the illustrations of this which we find in one day's mail, may be mentioned the failure of the strike at the Wamsutter Cotton Mills, at New Bedford, which has been notable for its size and organization. Two months and a half have been spent in the useless endeavor to gain their point, and 1000 hands have been living on charity when work could be had, and now they return to work on worse terms than those from which they struck. At Washburn & Moen's, at Worcester, an attempt to create a strike, because of a 10 per cent. reduction, was a failure also. A delegate convention of the coal miners of Western Pennsylvania, called at Pittsburgh, April 30, was a practical failure; but 17 delegates were present, and there appears to have been a "coldness in the meetin'." There was trouble about the "divies" to the striking miners, and the upshot was the resignation of the president and treasurer. At Stratford, Ill., the mines are being run by non-union miners.

The South African Exhibition, at Cape Town, is open and is a success. This announcement would be gratifying were it not for the fact that the United States are not represented. In neglecting these minor exhibitions in possible or actual foreign markets, our manufacturers make a serious mistake. Goods adapted to such markets should always be exhibited whenever a chance is offered. In such matters our English neighbors are wiser than we are.

A new method of train wrecking was developed in Jersey City on Wednesday last. A New Jersey Central Railroad train was coming into the depot in the sensational style which has become common among passenger engineers since the introduction of the air brake—dashing up to the entrance at the rate of 40 miles an hour and suddenly stopping the train within its own length, by a vigorous use of the "patents"—when a couple of miscreants managed to sever the connection between the engine and the brakes. The consequence was that when the engineer attempted to put on the brakes there was no response and he came very near landing his train, with over a hundred passengers, at the bottom of the river. This is the second train which this road has nearly lost at the same station through too much reliance upon the air brakes.

#### Scientific and Technical Notes.

The following are some of the more interesting particulars concerning the uses to which

##### PLUMBAGO

is applied in the arts: In the manufacture of crucibles, the plumbago should be as pure as possible for the best crucibles. For crucibles employed for steel or brass melters, the presence of mica is a decided objection. Crucible makers prefer the lead graphite to be of large flake. There are said to be many secrets as to the modes of mixing and qualities of the mixture of the plumbago and other materials used in the construction of the crucibles, and the success of some manufacturers is said to be largely due to the secrets which they possess concerning the methods of mixing and manipulation. Plumbago, when used for "electrotyping," must be as pure and as fine in texture as possible. As plumbago is used to give an electric conducting surface on a non-conductor, it is obvious that where impure plumbago is rubbed on the face of the non-conductor, any speck of sand or other foreign matter would leave a spot of a non-conducting substance, and the copper or other electro deposited metal would fail to be deposited over the non-conducting body. Hence a "dirty" plumbago would cause the electro deposited metal to be full of small pinholes. It should also be soft and a good "coverer." The better the plumbago, the less is required to be used to create a perfect electro conductor. Plumbago is used for powder glaze in order to give face, and to prevent absorption of moisture by the powder, and perhaps to prevent partial adhesion of the grains of the powder in case of slight dampness. It is also used to give a face to shot. For the above two purposes a rather inferior grade of plumbago may be used, but, as a rule, the purer the graphite or plumbago the less is required, and the better kinds are really the cheapest. For lubricating purposes the graphite must be absolutely free from grit, mica, or any other foreign matter. Its preparation for this purpose requires much care, in order that it may be clean. There should be enough flake plumbago to pack, so to speak, in the hollows and irregularities of surface of the journal boxes of machinery, and there should, however, be a large percentage of fine dust or powder to form a thin admixture with the oil or grease employed for oiling the machinery.

Plumbago should be as free from iron as possible for stove polish, since the presence of much iron (as a carbide) will cause the stove polish to burn red. The fatter and purer the graphite the better. The plumbago for pencil stock must be perfectly free from grit and all impurities. The quality of the lead for pencils is of the first importance. The lead should be soft ("fat") and of good dark shade. The preparation of the lead for pencil stock requires every precaution to insure perfect freedom from all foreign bodies. Too much care cannot be taken to obtain this end. The hardness of the various grades of pencils depends on the proportions and the admixture of clay which is added by the pencil maker.

M. Cabot, of Paris, who, if we are not mistaken, has several times added greatly to our stock of "magic" apparatus, has recently constructed a

##### VERY CURIOUS CLOCK.

which has two apparently free hands placed in the center of a double pane, the two sheets of glass composing which are held in an ornamental frame. The clock is operated by concealed mechanism in the frame, which once a minute causes a slight and nearly invisible motion of one of the glasses. This causes the movement of the minute hand, and a minute gearing concealed in the pivot of the latter actuates the hour hand.

Mr. J. J. Christie, of Wigan, Eng., has invented an

APPARATUS FOR REVERSING ROLLS, which is said to be an improvement upon the "five-wheel motion" in the direction. It is described as follows: To the ends of the neck pinions of the rolls, and in place of the ordinary coupling boxes, he attaches fixed clutches. On the bed plate of the machinery, and at a short distance from the standards in which the neck pinions work, he fixes a pair of standards, in which three pinions work. The axes of two of these pinions are coincident with the axes of the neck pinions; the third pinion is on one side, and gears with the other two pinions. Motion is communicated from one of the said two pinions to the other by means of the side pinion, so that the said two pinions both rotate in the same direction. The axes of the said two pinions carry sliding clutches, which are respectively opposite to, and can be made to gear with the fixed clutches on the neck pinions. These sliding clutches are geared to a rocking frame, by the motion of which in one or other direction either the upper sliding clutch can be geared with the fixed clutch on the axis of the upper neck pinion, or the lower sliding clutch geared with the fixed clutch on the axis of the lower neck pinion. As both the sliding clutches rotate in the same direction, the gearing of one of them to the upper or lower neck pinion communicates motion in the same direction to the said neck pinion—that is, communicates a motion in the same direction to either the upper or lower neck pinion. As these neck pinions engage with each other, they rotate in opposite directions, and the communication of motion in the same direction to the upper pinion produces motions in the geared rolls in a direction contrary to that produced when the same motion is communicated to the lower pinion.

Barbers often assert that RAZORS GET TIRED OF SHAVING, and consequently must be allowed to rest before they can be used again satisfactorily. Upon what authority the following statement has been made, we do not know: "It has been found by microscopic examination that the

tired razor, from long strapping by the same hand and in the same direction, has the ultimate fibers of its surface or edge all arranged in one direction, like the edge of a piece of cut velvet; but after a month's rest these fibers rearrange themselves heterogeneously, crossing one another and presenting a saw-like edge, each fiber supporting its fellow, and hence cutting the beard instead of being forced down flat without cutting, as when laid by." We have serious doubts of the truth of this statement, because in our own experience we have discovered some facts in regard to strapping a razor which render the reason for the need rest very plain, without the necessity for any supposed rearrangement of molecules. At times a man's hand changes its habit, and in putting a razor upon the strap this is sufficient to get the edge into such condition that it will not cut. Now, suppose it is laid aside for a month or so. At the end of that time it is taken out, but, before an attempt is made to shave with it, it is strapped, and then, of course, cuts very nicely, because the hand has probably lost or changed its bad habit. We have never found that the razor which, when it was laid away would not cut from being tired, would cut any better at the end of the month's rest than it did when put away, unless it was strapped anew. And, we presume, had the razor been given to another person to use, the "rest" would not have been needed.

It has been estimated that

ONE HUNDRED MILLION TONS OF WATER per hour pass over the Falls of Niagara, and its perpendicular descent may be taken at 150 feet, without considering the rapids, which represent a further fall of 150 feet. The force represented by the principal fall alone amounts to 16,800,000 horse-power, an amount which if it had to be produced by steam would necessitate an expenditure of not less than 266,000,000 tons of coal per annum, taking the consumption of coal at four pounds per horse-power per hour. In other words, all the coal raised throughout the world would barely suffice to produce the amount of power that annually runs to waste at this wonderful fall.

In a recent lecture on "The Sun," before the Royal Institution, Professor Gladstone said: Its nucleus is now believed to emit rays of every degree of refrangibility, and possibly consists of

##### A LIQUID GLOBE,

but its low specific gravity rather indicates a vast conglomeration of condensed vapors. The first atmosphere consists of vapors of metals, among which sodium, magnesium, iron, nickel, cobalt, chromium, manganese and many others have been recognized. They are, doubtless, constantly passing from the gaseous to the liquid condition, and form those white, hot clouds which constitute the moving, mottled surface we see. The clouds are sometimes heaped together in masses of unusual brightness termed facula, and sometimes give way to colder spaces, where absorption is greater, called sun spots. Outside this photosphere is another luminous atmosphere, named by Lockyer the chromosphere. It is red in color, and consists of hydrogen, with the more volatile metals, sodium and magnesium, several others being sometimes seen rising in it. This red zone is usually 5000 to 7000 miles high. Its visible limit is doubtless determined by the cooling of the glowing gas, but an atmosphere probably extends to at least 200,000 miles beyond the chromosphere. In this there frequently rise red flames of hydrogen of fantastic forms, some of which are 180,000 miles high, and move at the rate of 174 miles a second. Far beyond the red flames there is seen during a total eclipse of the sun the faint light known as the corona. This is believed to be due partially to reflected light, but it shows a peculiar yellow line identical with one found in the aurora borealis.

At this time an international commission are searching for a canal route across the lower part of Darien. They number among them several eminent engineers, such as Cellers, of the Ponto et Chaussees; Brooks, of the Institution of Civil Engineers, London; and Gerster, of Hungary, with others from Italy, and from the Colombian government, which made a concession for a canal in May last. Whether this large party meet with their expected success or not, it is generally expected that this work, to be continued for some months yet, will settle the question for that region definitely. In view of this fact and the general interest felt in the subject

##### SHIP CANALS,

the following is very timely: Ship canals are properly distinguishable from the barge canals of mere inland navigation by their being the gateways for commerce to the high seas. Their object is to shorten long or dangerous routes by opening navigation across a continent, as the Suez Canal, which saves half the distance from Europe around South Africa; or across some peninsula, as India, Greece, or Florida; or to connect inland seas, or lakes, as the Gotha Canal, and those proposed between some of our own great northern lakes. It is evident that very short ship canals may be of great service by making, as in cases like those last named, a continuous full ship navigation. The Gotha Canal, constructed 1794-1800, is but 3½ miles in length, and cost only £80,000; but by its joining the Cuttegat with the Swedish inland navigation, and outwardly with the Baltic, it is a work of military as well as commercial importance. Its cuttings at the point of the Trothoelita Falls are to a depth of 72 feet through the solid rock. The series of falls are 112 feet in height. The canal has eight sluices. The dimensions of ship canals have now so much increased that the designation seems scarcely applicable to the earlier attempts. As illustrative of this remark it may be remembered that the English engineers who, at Lord Malmesbury's reference, gave their judgment on the plans presented in 1853 by Mr. Childs

for the Nicaragua Canal of 17 feet in depth, condemned the dimensions as too small, in view of the increasing size of ships, which would probably still further enlarge themselves if a route were opened. At this day estimates are made for a depth of not less than 26 feet. The Suez Canal has passed safely the English troop ships which drew 25½ feet at the time of transit. The International Commission for that canal, appointed in 1855, wisely fixed its depth at 26 feet, although at the time of M. Leeser's visit to the great shipyard of Mr. Laird, at Birkenhead, it was the general opinion of ship-builders that the maximum ever reached would not exceed 24 feet. The Languedoc Canal, or "Canal du Midi," was the very first inter-oceanic work of the kind we are considering. It has a record of dimensions in marked contrast with these modern attainments. Its depth was but 6½ feet, and its surface breadth was but 65 feet; yet it was a work of great note in its day, and really a great undertaking for the resources of engineering and capital then available. It was constructed to save the sea voyage of 2000 miles, from the west coast of France around the Gibraltar Straits, to the Mediterranean. The idea of this route, advanced in the reign of Francis I, in the early part of the sixteenth century, was revived under Henry IV; but it was not put into execution until the latter part of the seventeenth century, under the patronage of Colbert, Minister of the Grand Monarch. This canal commences on the right bank of the Garonne, a short distance below Toulouse, and, following up the valley of the river, connects the Atlantic with the created port of Cete, on the Mediterranean, a distance of about 148 English miles. Began in 1664, the work was carried on without interruption till 1681, costing about 34,000,000 francs, and employing ten or twelve thousand laborers. Twenty-six locks on the Atlantic side and seventy-four on the Mediterranean, overcame a summit level of 567 feet above the sea. The lockage was fed by a reservoir of about 5000 feet in length by 2500 feet in width, and 100 feet in depth. The engineer was the celebrated Riquet, a member of the Ponto et Chaussees, who adopted the ideas of Andreossy, and enthusiastically devoted himself to the work, contributing from his own purse 3,000,000 francs. He died impoverished six months before the opening of the canal. Within the last few years the attention of several chambers of commerce and of French engineers has been called to quite a number of plans for opening a veritable ship canal along this line; a summary of these plans—most of which propose to transform the present canal into one of full ship navigation—will be found in *L'Explorateur*, No. 80, August 17, 1876. In favor of opening some route across France, it is argued with force that, at small expense, the merchant marine of France and of the western nations, as well as French military and naval forces, could thus be transferred from the Atlantic to the Mediterranean without passing under the canons of the Gibraltar Fortress. Beside this, the increase of imports at Marseilles and other Southern French cities has become very marked since the opening of the Suez Canal. The imports in some products have advanced five-fold; a Northern short route therefore is quite likely to be secured at no distant day.

Great success attends the enormous

DRAINAGE AND CANAL OPERATIONS of the Hollanders. The two undertakings usually go hand in hand, so that, as in the case of the new canal from Amsterdam to the sea, while the lands recovered by drainage are of enough value to reduce the total cost of the enterprise by nearly a third, there is a further advantage secured by the unity of the plan, since the process of constructing the canal was contrived so as to facilitate the actual work of drainage. That canal having cut off and secured the draining of a portion of the Zuyder Zee, a project for another canal, to drain the southern part of that body of water, is now before the Chamber of Deputies. The new canal is intended to give Amsterdam a direct waterway to the Rhenish provinces. The area to be drained is somewhat less than 400,000 acres. The cost of the undertaking, for which it is proposed to obtain government loan, is estimated at nearly \$50,000,000.

Famous as is the sub-Walden boring in the annals of English geology, the interest in it is for a while eclipsed by

##### ANOTHER DEEP BORE

carried on in the heart of London. The object of the new bore is purely commercial, but the scientific results of the operation are carefully noted and preserved for geologists' use. The intention is to sink a well for the use of a large brewery on Tottenham Court road. At 150 feet the clays and gravels were passed and the upper chalk began; from 490 to 812 feet the work lay through hard lower chalk and marl; at 840 feet, gault; at 1004 feet, "greensand," which is a solid stone. The work is done with a diamond drill. One crown of diamonds has cut 400 feet; but the strata have proved of very varied hardness, and the flints in the chalk have occasionally delayed the speed of the work, though not wholly stopping it. When there are no mishaps the progress is 14 or 15 feet per day. The value of the diamond crown of the boring tool is about \$500. Since the above was written later advices have been received, stating that water was struck below the greensand and the flow is abundant.

Work on the suspension bridge to cross the Hudson River at Poughkeepsie is being pushed vigorously. The American Bridge Company, having it in charge, have nearly 150 hands at work, and the force will presently be increased. Two caissons have already been launched and a third one will be started this week. The concrete and stone and cement is being forwarded as rapidly as possible. The company have purchased a steam-tug and large derrick barges, and are using nearly 200,000 feet of timber

day, which is shipped to them by canals and railways. Ten or twelve car loads of machinery, engine, boilers, &c., have arrived from Chicago.

#### American and Russia Sheet Iron for Locomotive Jackets.

During the Centennial Exposition we noted the fact that, without any preconcerted plan, it was found when the American locomotives were in place, all but two were jacketed with W. D. Wood & Co.'s planished sheet iron, manufactured at Pittsburgh. The appearance of this was so much superior to the genuine Russia iron, whose place in the arts it is intended to supply, that experts favorable to the foreign iron invariably mistook the American for the genuine Russia, being deceived by its superior finish. Since then we have carefully observed the results of the use of this iron for locomotive jackets, and have made inquiries touching its success, and we see no reason to change the opinion we then expressed—that it was in every respect the equal of the genuine Russia, and must entirely supersede it for the use indicated. We understand that it has virtually done this already, most of the prominent roads in the country using it exclusively, including all the roads leading into Philadelphia, Baltimore, Pittsburgh, Cleveland, Chicago, St. Louis, and many of the prominent lines leading into New York.

Prominent master mechanics of the longest experience mention as some of its advantages for jackets: 1st. The iron can be furnished in any lengths desired, so that it can be put on the locomotive without any waste. 2d. The Russia is often crooked and full of buckles, but the planished iron, being made expressly for this use, with full knowledge of these troubles and the ability to obviate them, is free from these imperfections. 3d. The process of manufacture is such as to make it capable of resisting the action of the atmosphere better than any other iron ever made. As it is not necessary to subject iron for jackets to the strain of double scarring, the iron is much more dense by double hammering, thereby closing the pores more thoroughly, and enabling it more effectually to withstand the oxidizing action of the air. 4th. As a result of this extra hammering, and the consequent closer texture and smoother surface, it is the unanimous testimony of engineers and wipers that the "planished" iron wipers much easier than the foreign iron. 5th. The superior gloss and finish give a much better appearance to the locomotive, and, lastly, the iron is cheaper in price.

Parties wishing to investigate this matter for themselves can inquire of the master mechanics of the Pennsylvania Central, the Baltimore and Ohio or the Reading, as these roads have had it in use for several years, and are better able to give an intelligent opinion as to its merits.

**Labor Troubles at Pittsburgh.**—During the past week there have been four strikes among the iron workers of Pittsburgh—two at blast furnaces and two at rolling mills. Those at furnaces have been on the question of wages. The cause of the strike at the Isabella Furnace is given in our Industrial Items. The strike at the Clinton Furnace of Graff, Bennett & Co. was for a similar cause. The men refusing to go to work were at once ordered out of the tenant houses, and as they refused to go willingly, were evicted to make room for those who would work at the prices offered. At the rolling mill of A. M. Byers & Co. the trouble was occasioned by the watchman charging one of the puddlers with stealing a "scrap ball." He was discharged by the superintendent; but as he denied the charge the matter was brought before the Union, and he was sustained. Subsequently the watchman made an affidavit to the fact, and the party charged failing to make a counter affidavit, the men resumed work, after having been idle two days. At Lewis, Oliver & Phillips' lower mill, in the Ninth ward, Allegheny, the puddlers say that they have been furnished slack instead of lump coal to use in their furnaces, by which their labors were very much increased, and they demanded that they be furnished with good coal. This the proprietors declined to do, and the puddlers quit work. The mill is now all shut down except one small department. However, it should be noted that these strikes will not in any way interfere with the operations of these firms, and so far as the rolling mills are concerned, seem to be more for a purpose than because there is any real cause of grievance. It looks like an attempt to create an issue other than that of wages, and to provoke sympathy.

The Burlington *Hawkeye* says: "Emigrants and others travelling to Nebraska by teams will be interested to know that a good, substantial car, one hundred feet in length, nine feet wide and ten feet high is now running daily over the Missouri River railroad bridge between Council Bluffs and Omaha for the purpose of carrying teams and wagons over the Missouri River at that point. Horses can be driven into this car at the end without unhooking from the wagon, as readily as they can be driven over a covered bridge or into a barn. The car leaves Council Bluffs every hour in the day, from 8 a.m. until 6 p.m., excepting 12 o'clock noon. The teams are carried over the river and the bottoms, a distance of nearly three miles, in perfect safety, and in only fifteen minutes' time."

By an unfortunate error in the first page illustrated article in our issue of April 26, the firm name of the makers of the improved portable engine was wrongly given. The manufacturers are the Erie City Iron Works, of Erie, Pa., and not the Erie Iron Works, as stated. By another unfortunate error this correction was omitted from our issue of last week.

## Some Facts About our Foreign Trade.

The letter from the Secretary of State transmitting to the House of Representatives an annual report upon the commercial relations of the United States with foreign nations during the year 1876, has just been printed. The following extracts in relation to trade with South America, France and England, and in regard to emigration to the Southern Continent, are important and interesting:

There has been during several years a noticeable uniformity in the consular reports to this department from nearly all business portions of the world in respect to a decrease in manufactures and commerce, and general apathy in the operations of other principal branches of business. From these reports, taken together, it has appeared that the operation of the causes producing these discouraging effects extended with a degree of uniformity to the industries of all countries, aggravated undoubtedly in many by the local conditions. Our own country, while afflicted with others by the general depression, does not seem to have been the greatest sufferer, either by direct losses or incidental privation. The annual reports accompanying this letter enable me to notice that a more hopeful feeling prevails in many portions of the business world; that manufacturing, commercial and other industries are reviving or proceeding under healthy conditions of demand and supply; and that, therefore, the long depression in the peaceful activities of many nations is materially disappearing. It is not unreasonable to expect that the returning better conditions will be as favorable to this country as to others.

The commercial returns from Brazil are such as to render it impossible to make a satisfactory statement of her commerce or navigation, and the interest of the United States therein. Although neither is large, both are increasing, and must become important in many ways to us. Under the four flags, of Great Britain, France, Germany and the United States, the last named had nine per cent. of the ships and 11½ per cent. of the tonnage.

Commercial information for the year from the five States of Central America is very limited. In 1874, out of a total foreign commerce of over \$27,000,000, the part of the United States was less than \$6,000,000, and that of Great Britain a little more than \$6,000,000, these nations leading. Until recently British traders have, during more than fifty years, monopolized the foreign trade of the country. Recently our trade with it has slowly increased. The foreign commerce of the country lying south of the United States on the American continent may be nearly estimated to be, at the present time, \$520,000,000 in value, in which the United States shares to the extent of \$112,350,000, not over one-third of which is transported under our own flag. This country is a seemingly uninterested spectator of the continuous and slowly successful efforts of its near neighbors, whose destinies are involved to a greater extent than are those of other portions of the world with her own, to emerge from the traditional hindrances into a development which, for the interest of all, should be in sympathy with her, and which may properly be influenced to a large extent through the peaceful operations of commerce.

The foreign commerce of France, general and special, for 1874 and 1875 shows a decrease in the general commerce of \$10,769,000 during the year, and an increase in the special commerce of \$38,597,000, over 85 per cent. of which increase is in exports. The principal articles and the value of them entering into the commerce between France and the United States during the year were as follows:

*Principal Imports from the United States.*

Cotton.....	\$25,253,000
Hides and skins.....	2,550,000
Petroleum.....	2,478,000
Lard and tallow.....	1,526,000
Tobacco.....	1,044,000
Copper.....	693,000
Meat.....	539,000
All others.....	2,026,000
Total.....	\$36,709,000

Nearly 93 per cent. of the imports was in the seven enumerated articles, none of which had been more valuable by processes of labor, except a portion of the pétroleum, which was refined.

*Principal Exports to the United States.*

Silk tissues.....	\$15,596,000
Woolen tissues.....	9,312,000
Leather manufactures.....	3,443,000
Hides and skins, prepared.....	2,390,000
Wines.....	2,027,000
Mercery and buttons.....	1,968,000
Feathers, ornamental.....	1,000,000
Braided goods, straw, &c.....	28,000
All others.....	14,604,000
Total.....	\$51,029,000

Nearly 71.5 per cent. of the exports to the United States was in the eight articles named above, none of which left France without rendering, subsequent to first production, the highest tribute to her modifying industries. Fifty-seven per cent. of the whole commerce between the two countries was in fifteen articles, of which those sent from the United States represented the rudest, and those received by them the highest, achievements of labor. Beside the manifest inequality, in a material point of view, of such condition of product exchange, the difference in the cultivating influence upon the people of a country involved in the two modes of production may be thought to be a subject worth consideration.

The Argentine Republic, Peru and Australia, as well as Mexico, have held out inducements recently to emigrants from all countries, and under the influence of the hard times, which have by most people of each country been erroneously supposed to be local only, a moderate movement in emigration has been made toward those points. Many persons, citizens of the United States, have sought to better their condition by joining in it. Reports from our consular officers in the countries named show that repatriation has invariably followed such steps, and that often, from the want of means

of immigrants, it is unavailing, though in some instances masters of American vessels have been induced to aid the return of their countrymen, through a generosity which must necessarily have limits. The entire experience of those who have emigrated from the United States, goes to show that, from the circumstances surrounding such movements, they have not resulted and cannot result satisfactorily.

**Receipts of Pig Iron, Ore, Scrap, etc., at Pittsburgh for April, 1877.**—The receipts of pig metal, ore, scrap iron and blooms for April, which we give below, show a falling off of nearly 5000 tons from the aggregate for the preceding month, but are considerably above the monthly average for the past three years, footing up 42,623 tons. The total receipts of raw material for the first four months of the year are 164,446 tons, or at the rate of nearly 500,000 tons for the year. It was to be expected after the heavy receipts for March that the total for April would decrease materially, and considering the liberal supplies which our ironwork had on the 1st of April, the large totals below argue a very gratifying state of activity, notwithstanding the complaints which are so generally heard among our iron men. The statement of receipts for April by the various routes are as follows:

	Metal, tons.	Ore, tons.	Scrap, tons.	Blooms, tons.
P. F. W. & C. Ry.....	11,440	1,930	1,470	80
C. & P. R. R.....	270	12,480	200	...
P. R. R.....	2,740	330	...	...
Pgh & Conn R. R.....	1,460	...	380	30
A. V. R. R.....	190	...	410	30
P. C. & St. L. Ry.....	10	...	150	...
West Penn. R. R.....	1,300	...	...	...
River.....	3,368	1,620	2,645	100
Total.....	20,778	16,080	5,585	230

—*Commercial Gazette.*

**New York's Water Supply.**—During the drought of last summer and autumn the water in the Park reservoirs was drawn down 25 feet below its normal depth. Since the 8th of January last the aqueduct has carried and is now carrying water to its full capacity, so that the reservoirs have been replenished to within 16 inches of high water mark, which is a depth of 36 feet. At the same time the consumption of water is now at its highest. The fountains and drinking hydrants that were closed during winter are again running, the streets are being sprinkled and water is used in divers other ways incident to the season. It is necessary, therefore, to be as careful now to avoid waste as at the time when the supply was reduced by drought, since in the exact measure that water is wasted its pressure is decreased and the higher points are deprived of their supply. It was never expected or contemplated that the regular Croton water system would supply the higher points on the island, and for many years after its introduction these high points remained unoccupied and needed no water. Since they are built upon it became necessary to erect the high service works at High Bridge, which are now taxed to their full capacity. The department has determined to build additional high service works in the shape of a stand pipe on the ground of the city at Tenth avenue, near Ninety eighth street, and the legislation to confer the necessary authority has been applied for. These works, when completed, will enable the department to supply the elevated points on the island. Meantime, whatever points now fail to receive the water by its own pressure, whether from the regular or the high service, must secure a supply by pumping or other means. It is probable that some points that had a supply before the late drought are not now reached by the Croton water, but it should be remembered that the pressure at high levels is constantly decreased by the increase of consumption and the extension of the system. It is expected that a large source of waste will be stopped by the application of meters at railroad and omnibus stables, just ordered by the Commissioner of Public Works, and that the pressure of water will be correspondingly increased.

Co-operative schemes seem to multiply. Centralia, Ills., is the latest one, and the object is to build a rolling mill. Their prospectus is an eloquent appeal for subscriptions and should move a puddle ball to tears. Read it: "Now, the company wish to organize under the co-operative plan. Every boiler, heater, roller, nailer and other skilled laborer will have to take a certain amount of stock, in order to prevent strikes and disputes, so as to work harmoniously together and build up a large institution through co-operation, and prevent the scum and black scabs of the country from entering thereto, but to have a class of sober, industrious and intelligent mechanics, who will make Centralia their future home, and who will come and share the joys and sorrows of the iron trade together." We advise our readers, who have any desire to enter into manufacturing, to look at the history of just such attempts under much more favorable circumstances.

The Springfield (Illinoian) Iron Company have been making a number of improvements in their works. Small cranes are now used for charging rail piles into the furnaces, and a steam ram for pulling them out, and there is also machinery for carrying rails to the saws after rolling, and for sawing, curving and carrying to the cooling bed, so that only one man is employed for all these operations. Some of the Siemens' gas furnaces have been rebuilt, so as to reheat the rail piles, and arrangements have been made to roll the light rails in double lengths (60 feet), afterward cutting them in two. It is believed that light rails of this length have not before been made as a regular practice.

The Baldwin Locomotive Works have just closed a contract for 19 locomotives for Brazil. Fourteen of these are for the Dom Pedro II Railway, and five are for a narrow gauge road.

# AMERICAN SCREW CO., Providence, R. I.

Manufacturers of

## IMPROVED Gimlet Pointed Wood Screws, Patented

May 30,

1876.

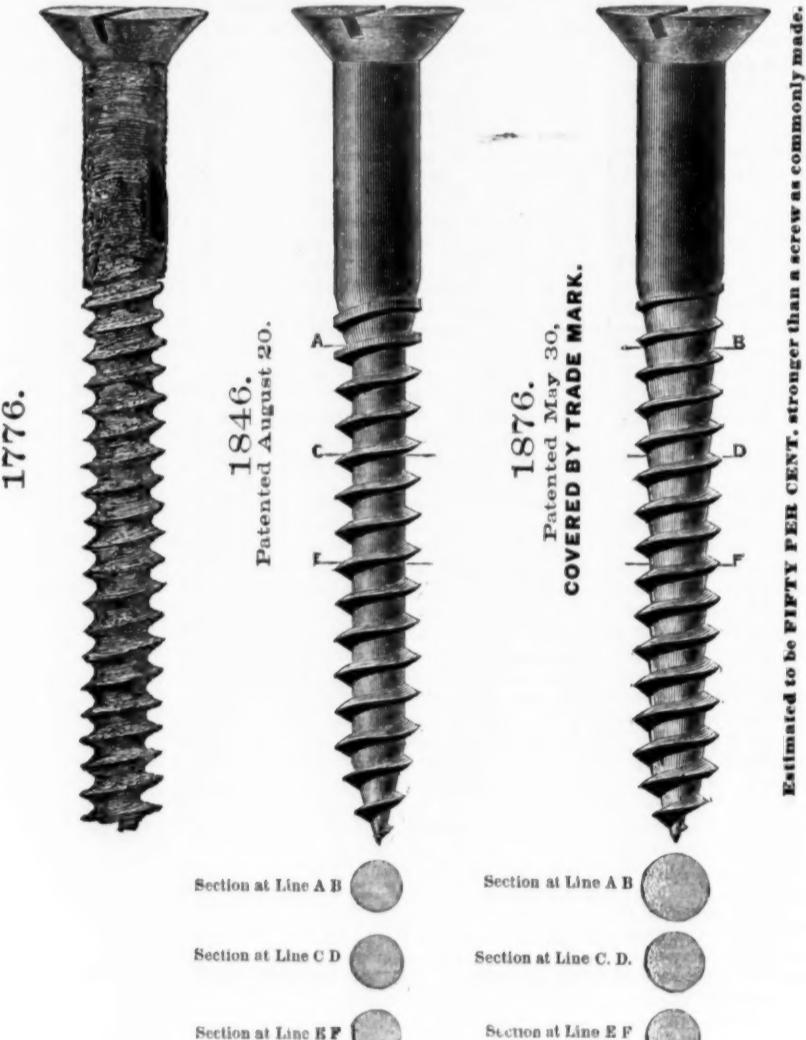


After forty years' experience we offer to the trade our **Centennial Screw**, patented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our machinery as fast as possible, to manufacture the **improved** article only. To introduce them, they will be sold at same price as the old style screw.

The new screws will be packed in manila colored **boxes** with new label covering end of box, and **enlarged figures** showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.



The above drawings show the progress of screw making from the old **blunt point** to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the heel of the thread, where all the strains of forcing the screw into the wood naturally concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of all manufacturers, but every expedient hitherto adopted has proved as objectionable as the evil complained of.

It will be seen in our **new screw** that not only is the sharp angle avoided, but the strength very much increased, as illustrated above. See sections at lines.

### CLAIM.

"A Pointed Wood Screw having the outer periphery of the thread upon us body cylindrical, while a portion of the body below the thread and near the neck is conical, the remainder of the body to the point being cylindrical, and yet having all the thread brought to an edge of a constant angle, without jogs in the paths between the threads, substantially as described."

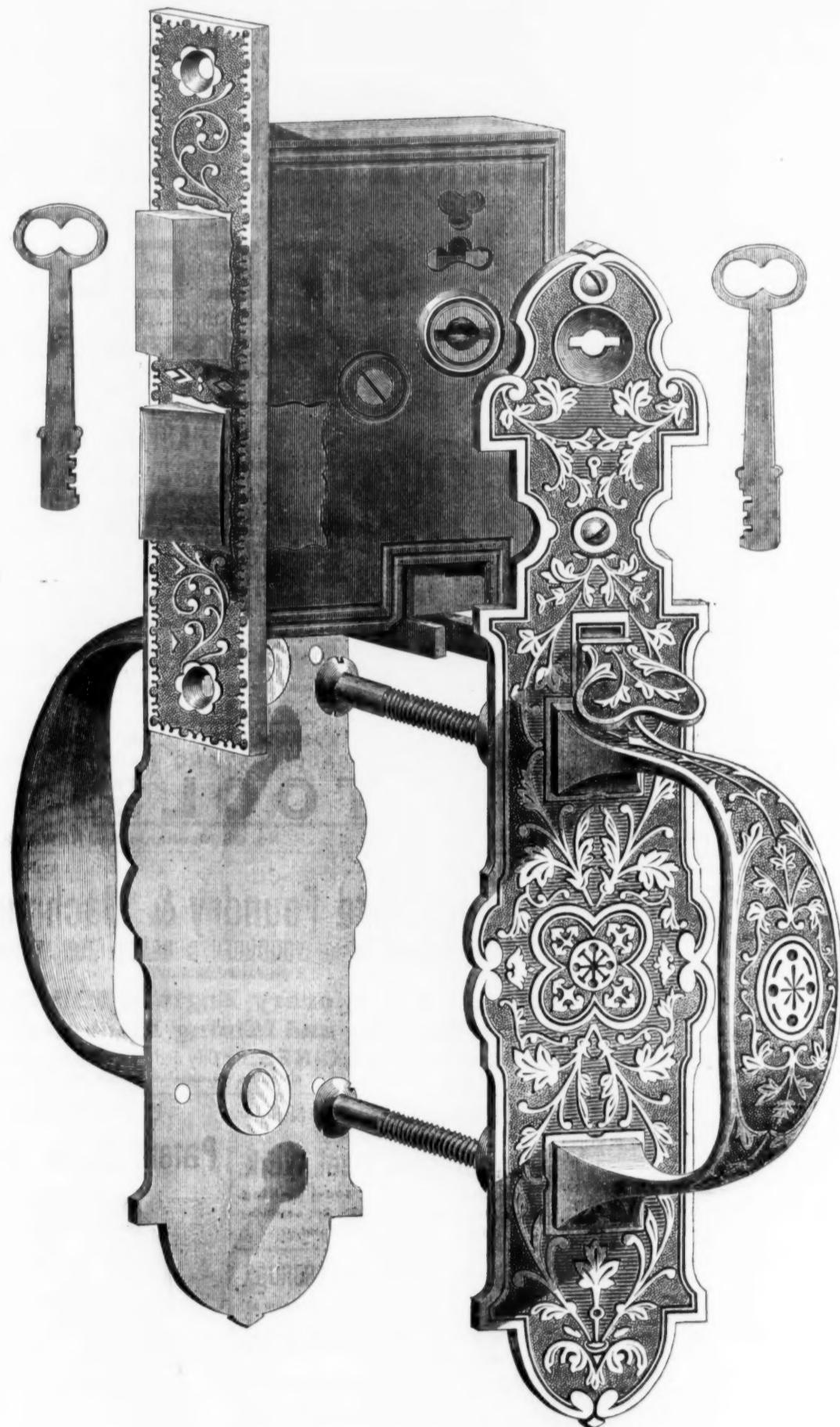
**P. & F. CORBIN,**

MANUFACTURERS OF

**BUILDERS' AND MISCELLANEOUS HARDWARE.**

Factories, NEW BRITAIN, CONN., U. S. A.

Warehouse, NEW YORK, Nos. 87 CHAMBERS and 69 READE STREETS.



No. 3109 Handle, with No. 86 Mortise Lock, 3-4 Size.



No. 3110 Handle, Gothic Pattern, 3-4 Size

**PATENT STORE DOOR HANDLES, with ESCUTCHEON COMBINED.**

Put up with Heavy Mortise Lock and Latch, Flat or Rabbeted Front, 3 and 5 Tumblers, Nickel-Plated Keys.

The above are finished in Light or Dark Bronze or Nickel and Gold-Plated to suit the trade.  
For further particulars see our Illustrated Catalogue and Price Book.

## Homes for Workingmen.

Mr. Lorin Blodget, in a paper contributed to the *Penn Monthly* on the building system of Philadelphia, says:

The urgent question of the day is whether it is possible for the people of this country to live in the great cities in safety, occupying separate homes, and living in reasonable security in dwellings of their own. It is certainly a great question, and on its solution depends the further question, whether it is not inexcusable cruelty to permit a million of people to gather in any great city.

Through the rare good fortune of possessing an especially favorable site, the development of an adequate system of city house building has fallen to Philadelphia, at least so far as the inauguration of such a system is concerned; and perhaps fifteen years of continuance at it have vindicated and confirmed it. It cannot be claimed as having been deliberately designed, nor is as yet carried to anything like its proper completeness of results. But it has made great progress, and has grown to such proportions as justly to attract attention in most of the cities where the want of a proper system causes great loss and suffering. The object of this paper is to state, as clearly and directly as possible, what has been done here in order to aid others in making use of the results of our experience. It is also desirable just now to help forward the general work of perfecting the system here, and it cannot be too strongly stated that the object proposed to be attained is almost the highest that can engage attention. It involves the greatest results possible in the happiness of great numbers of intelligent people, and in their advancement to a higher civilization. It affects the habits of the thousands who too often spend their small earnings in mere daily living, and decides whether or not they can acquire and possess real property. The difference between proprietor, however small, and an incapable or a wasteful spendthrift, often reaches far beyond the personal interests of either or both, and becomes an element of the greatest public dangers.

The actual mode of proceeding in what are here called building operations is co-operative. The owner of the title to the land unimproved is one party, the one who advances capital or money to build is another, the contracting builder another, and often the several sub-contractors enter into the work as parties in interest, agreeing to take a certain number of houses at their share of the cost of building a large number. The co-operation of three distinct interests is the most general, the land owner, the capital advance and the contracting builder; but it is perhaps equally frequent that the land owner advances a sum of money equal to the value of the ground, which sum of the two elements of cost is placed in a ground rent or mortgage on the building contracted to be built. But the co-operative feature is always foremost, and it is indispensable to success. If the furnisher of materials, as lumber, bricks, stone or anything else, agrees to take a number of finished buildings for his materials he probably values his materials higher than if sold for cash, but he simply shares in the profit of the general contractor, and is a co-operative builder himself. The fact that in some cases this co-operative building is not as well done as it should be is quite likely to be realized, but it only occurs when proper supervision is not provided for. As compared to building for cash, under rigid supervision, the loose co-operation of what are called bonus building operations is not desirable; yet many thousand dwellings have been so built in a most creditable manner, and now constitute streets and blocks much increased in value, fully occupied, and paying a fair profit on all they cost. Thousands of dwellings have been so erected by contractors who had no capital themselves, and who, in perhaps half these cases, made little profit. Others more skillful made profits rapidly, even by what is called bonus building, and became able to build with their own capital.

The public are concerned only with the final results; if these present the form of well-built streets of permanent dwellings, owned by those who occupy them, it is of little consequence whether the original builder had any capital or made any profits, whether the operation was a co-operative or "bonus" arrangement, or whether all the expenditures were by one party only.

Of the mode of erecting buildings in the tenement house system we know little, except that it cannot be co-operative. It cannot afford negotiable securities in ground rents or mortgages, nor can it interest or employ many persons. Its range must be very narrow, and without social or other features of general interest. In a few cases such building is primarily with a benevolent purpose, and may, like the Peabody buildings in London, become conspicuous public benefits. But in most cases the tendency is to parsimony and abuse in the erection of the buildings themselves, and still more in their subsequent management and in the treatment of their tenants. The details of management of thousands of these buildings are given in the New York Sanitary Survey of 1865, and a more frightful picture of sordid avarice than that developed by that survey as existing in the management and care of these tenement houses could not be imagined. The squalor, vice and enforced misery of the unfortunate occupants exhibit a state of things to which the comfort of prisons and penal institutions affords a relieving comparison. No greater contrast can be conceived than is presented by the comparison of a well-built street of two-story brick dwellings, neatly kept, and chiefly owned by workingmen occupants, with the narrow alleys separating double rows of lofty tenement houses, reeking with filth and vice. Surely the building surface of the earth is large enough to distribute these foul accumulations, and to

cleanse them by a reasonably wide dispersion.

All experience has shown that for the best ends of society there must be, in the relation of men and families in a city to each other, something like the theory of the citizen's position in political life; each must enjoy and retain a separate individuality, with entire liberty under due responsibility. Give every possible opportunity, but hold every man and every family in a city to responsibility as independent elements of society. In a tenement house the occupants soon cease to recognize any responsibility; they are reckless and wasteful of what is their own, and what is not their own. In a house which has cost the occupant care and labor to purchase and to furnish, the foremost thought of the owner and occupant is to maintain and improve it.

## STANDARD FORMS OF THE SINGLE HOUSE.

The form of building under the single house system is established with much uniformity—perhaps too entirely uniform, some may say, but the necessities of the case admit only the best, and it can scarcely be denied that the forms employed are wonderfully successful. There are three primary forms, as they may be called: described as the two-story four-roomed house, the two story six-roomed, and the three-story eight-roomed. They are always of brick, erected on stone walled cellars not less than 7 feet deep, 14 by 28 feet for the smallest houses, 14 to 16 by 42 to 45 feet for the six-roomed houses, and the same for the three-story houses of eight rooms, which differ from the larger two-story houses only in having three stories on the front and two stories at the back. All these are built in contiguous rows or blocks, with a common wall between them. No external or dividing wall is less than 12 inches thick, with hard or pressed brick for the outside, and salmon, or light absorbent brick for the inner facings. There is little criticism possible upon either the materials or the mode of building of these standard houses, which have taken the place of all others almost, and are limited by well defined building laws, so that there is scarcely any opportunity for the substitution of inferior structures. In fact, there is no temptation to do so; the great number annually built, and the facility of access to unbuilt suburbs, would deprive the careless or lawless builder of all profitable use for poor houses. Other restrictions and usages also aid in protecting those who use these houses; they cannot be built of wood, nor can any alley be used for frontage; no street less than 30 feet wide can be opened or built upon. Under the protection of these general conditions, building has made rapid progress since the inauguration of the system, which scarcely dates before the year 1862. In 1867 it began to be especially active, and since that time an average of 4500 houses yearly have been erected, of which 2500 have been two-story, 2000 three-story, and of dwellings not more than 70 years of greater proportions. This rate of increase is much greater than that of other cities of equal population. At New York the annual increase of dwellings not over 600, the most of these, indeed, being costly structures erected for the private residences of the wealthy. The number of new tenement houses erected is small, the greater movement in this direction being the change from old buildings originally built and occupied for private dwellings or as stores or warehouses. The Sanitary Survey of 1865 found that four-fifths of the tenement houses then in use were altered from other forms for this purpose.

In the conduct of house building, as of every other business, there are many unsuccessful attempts, and many instances in which the property changes hands before completion and occupancy. But whatever the good or ill fortune of the intervening parties, the contractor, the workman, or the furnisher of materials, the general public only need to know that the houses are built and duly occupied by owners or tenants. They pay a profit, on the whole, to each of the necessary parties to their erection, and they represent a very large and active employment of both capital and labor. Taking the average value of the 4500 houses annually built at not over \$3500 each, the total is \$15,750,000 of value created yearly.

The capitalization of the land itself in the erection of these buildings is a very important question in considering the application of the system elsewhere. It is generally believed that land is too valuable near New York and Boston, at least. To decide this question it would be necessary to see what these houses would be worth there. Those of two stories with four rooms are here worth \$1200 to \$2500 each, with a rental of \$11 to \$18 per month. The two story six-room house is worth \$2500 to \$3800 each, with a rental of \$16 to \$25 per month. The three story eight-roomed house is worth \$3000 to \$5000 each, with a rental of \$20 to \$35 per month. Taking the usual proportions of these three sizes there may be, and actually have been, built upon a square 400 by 400 feet, with exterior streets 50 feet wide, 120 to 130 dwellings on each square; and the land is capitalized at \$100,000 to \$125,000. To this is often added an equal amount as advances, or as money furnished by the owner of the land for building it up; and there may be, also, a nearly equal sum representing the further cost incurred in finally completing the dwellings. The cost of a built up square, as thus made up, therefore varies from \$300,000 to \$325,000. Often the salable value rises to \$400,000 or \$450,000. Converting these items into their equivalents in cost per acre, it will be seen that the land before being built upon represents \$80,000 per acre, nearly, which is certainly a full average value for suburban real estate anywhere.

This distribution also admits an unexpected density of population. In a square mile there might be 130 squares of this size—400 by 400 feet; and with 120 houses on each square, the population would, at five persons each house,

be 600 persons on a square, and 78,000 on a square mile. This is not an unreasonable dispersion, and in fact it much exceeds the average density in large cities.

## OWNERSHIP AND OCCUPANCY OF HOUSES.

A further question is presented in the conditions of occupation and ownership of these single houses when built. It might be inferred that so large a number of dwellings could not be built year after year, if they were not called for and occupied; but whether they are taken as investments by persons who rent to others, or whether they are purchased directly by those who are to live in them, is an important distinction.

The facts are, that chiefly through the fortunate agency of building associations much the larger share of all these buildings are, within two years after their erection, bought by those who live in them. An extended examination of a district near the southern border of the city, conducted by me at intervals during the past year, shows that three-fourths of the dwellings erected two years or more are owned by those who reside in them, and nearly half of those which are properly and carefully built are purchased during the first year. In a space less than a mile square, centrally situated, but reaching to the southern limit of the built up area, more than 4000 dwellings were examined recently. Of these, the proportion vacant was less than two per cent., and while some blocks were carelessly erected, and remained for a year or more unfinished, all were ultimately well finished and fully occupied. The condition in regard to personal ownership was not so easy to ascertain; certainly more than half were owned by their occupants, and often entire blocks of thirty or forty houses each would show not ten per cent. rented.

These statements are given simply to represent the average condition, and they would be substantially the same for any section of the city near its outer limit. The fact that several blocks on the section examined were erected by persons unable themselves to finish them, and, therefore, most likely to represent the worst phase of the single house system, appeared to require that the facts should be ascertained. The result fully sustains the system, and shows that even in unskilled hands it cannot be a failure.

## A Terrible Mine Disaster in Pennsylvania.

Advices received by telegraph, as we go to press, report as follows:

ST. CLAIR, PA., May 9.

A terrible explosion of gas occurred in the Wadesville mines, near St. Clair, at about 10 o'clock this morning, killing and wounding nine men and imprisoning five others. The Wadesville shaft, which is 800 feet deep, is situated between Pottsville and St. Clair, and is operated by the Philadelphia and Reading Coal Company. The first warning of an accident was the sudden alarm sent up to the bosses for aid. Descending immediately they recovered the bodies of John Durkin and William Kirk, who were killed outright, and hoisted them to the surface. Seven more men were then reached, all being seriously burned, and it is thought that three of them cannot possibly recover. The five men still buried are behind two hundred tons of coal, which was displaced by the violence of the explosion. A large force of men are removing this mass of coal as rapidly as possible, and some of them think the imprisoned men can be reached by night. Others connected with the mine think that it will be impossible to liberate them before morning, as the gangway in which they are imprisoned runs under the surface for more than a mile, making it a slow and laborious task. The scene at the mouth of the shaft is heart-rending. A large number of men, women and children are gathered together anxiously awaiting the rescue of their friends and relatives in the mines.

## LATER.

The names of the men in the mines are Benjamin Mosely, Herbert Moore, Thomas Conners, Joseph Milwood, and the name of the fifth man is unknown. Before the men can be rescued it is feared it will be too late to save their lives, as they have been in since 10 o'clock, and at this time, 1 p. m., their chance of escape seems gloomy.

## Riehle Bros. Testing Machines.

We give below a report of a sub-committee of the Franklin Institute, department of the Committee on Science and Arts, upon the subject of Messrs. Riehle Bros. testing machines:

HALL OF THE FRANKLIN INSTITUTE, PHILADELPHIA, March 3, 1877.

The sub-committee of the Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, to whom was referred for examination Messrs. Riehle Bros. testing machines, report that the testing machines of the Messrs. Riehle Bros. consist essentially of two sets of tool or grips, which hold the specimens to be tested between them; the strain being applied to one set of the grips and the weighing apparatus for determining the amount of strain to the other. The grips are of different kinds and shape to suit the different materials and forms to be tested, and can be arranged either for tensile, compressive or transverse strains.

The power producing the strain is obtained on the larger machine by hydraulic jacks, and on the others by screw and gearing. The weighing apparatus consists of a series of levers, working on knife edges, and a double weigh beam for ascertaining the amount of strain applied to the specimen.

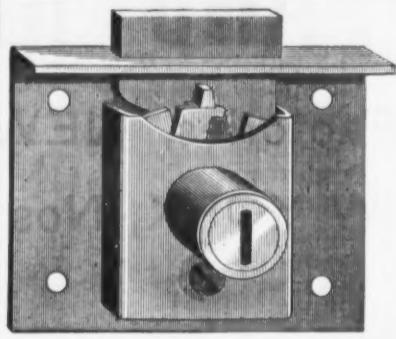
The machines are of different construction to suit the different purposes for which they are intended. The designs of the more recent are excellent, combining strength, compactness, convenience of operating, and sufficient ac-

curacy for practical purposes; and we think the Messrs. Riehle deserve every encouragement in their effort at simplifying, perfecting and introducing testing machines to manufacturing establishments, for the reason that the products and constructions of such establishments would continually tend to improvement and greater reliability from the constant making of tests of materials. Anything tending to improve the quality, and to fix standards and grades for materials, based upon actual tests of the elasticity, toughness, ultimate strength and other peculiarities, should receive the support and aid of the Franklin Institute, and we are of the opinion that the efforts of the Messrs.

Riehle Bros. have this tendency, and therefore deserve the commendation of this Institute.

WM. H. THORNE,  
C. CHABOT,  
L. R. FAUGHT,  
THAD. NORRIS, JR.

In a recent lecture on heat, delivered at the Royal Institution, Prof. Tyndall described an invention of Mr. Siemens to detect the oxidation of telegraph cables. The instrument indicates the heat that the oxidation occasions, and thus shows to what extent the rust is forming. It is chiefly of service with cables while coiled in tanks.



List Price, - - \$8.50 per dozen.

Subject to usual discount.

## Drawer Lock.

THE  
"STANDARD."

Applicable also to Cupboards, etc.

Made wholly of Brass, and finely finished. Each Lock has two flat, steel, nickel-plated Keys.

Dealers desiring to examine this Lock will receive a sample without charge, by addressing

The Yale Lock Mfg. Co.,  
STAMFORD, CONN.

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Manufacturers of SUPERIOR

## STEEL

Of all Descriptions

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Sole Agent for the United States.

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## THE HASKINS ENGINE.

Combined with Boiler, like cut, to 12 H. P.; independent, to 100 H. P.

## OUR GUARANTEE.

Ten (10) per cent. less fuel than the best. Thirty (30) to fifty (50) per cent. less than the so-called cheap. Fifteen (15) per cent. greater power, size for size. For greater durability and extreme simplicity, and all this based on the size of our engine.

NOTE.—Forged Steel, Piston Rods, Valve Rods, Connecting Rods, Crank Shaft and all Pins. Best No. 1 Babbit and box metal Boxes, and only the very best stock in Engines or Boilers. Low prices based on rapid duplication by standard gauges.

IN USE ALL OVER THE WORLD.

All Boilers insured by the Hartford Boiler Insurance Co. free.

The Best is the Cheapest.

Fitchburg Steam Engine Co.,  
FITCHBURG, MASS., U. S. A.

In sending for pamphlet, please say where you saw this.

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Manufacturers of SADDLERS' AND HARNESS MAKERS'

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Particular attention paid to Model Making.

Gear cutting for CLOCK WORKS, &c., a specialty.

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SAMUEL H. JACOBUS, Gen'l Manager &amp; Treasurer.

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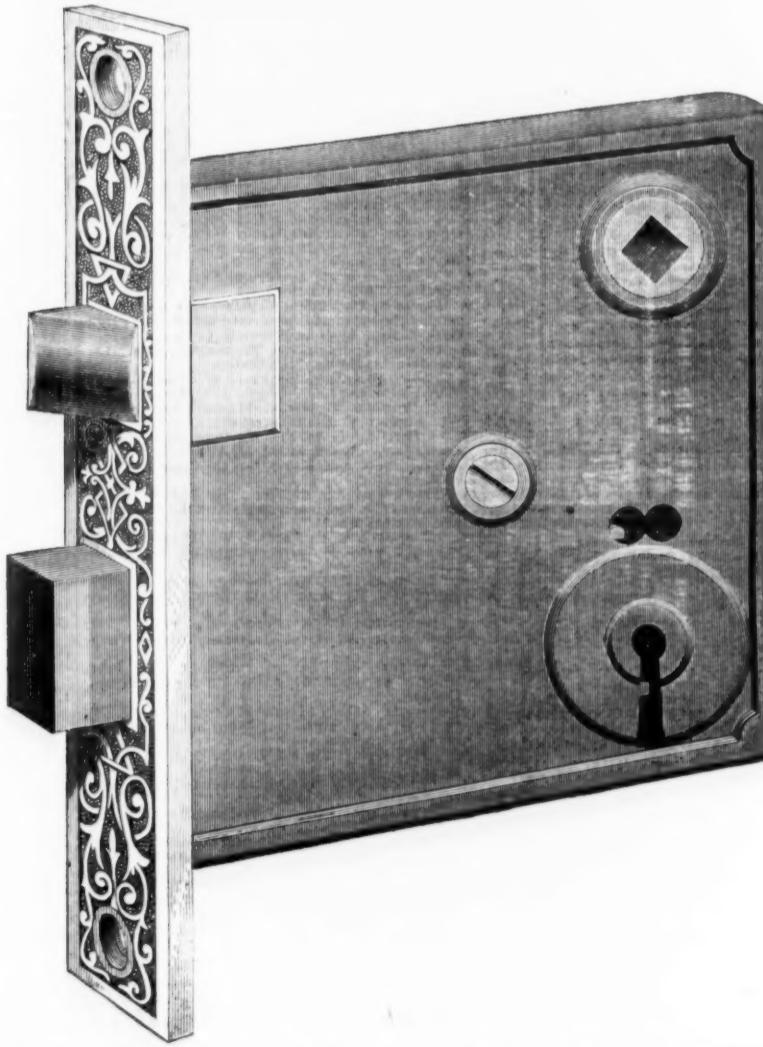
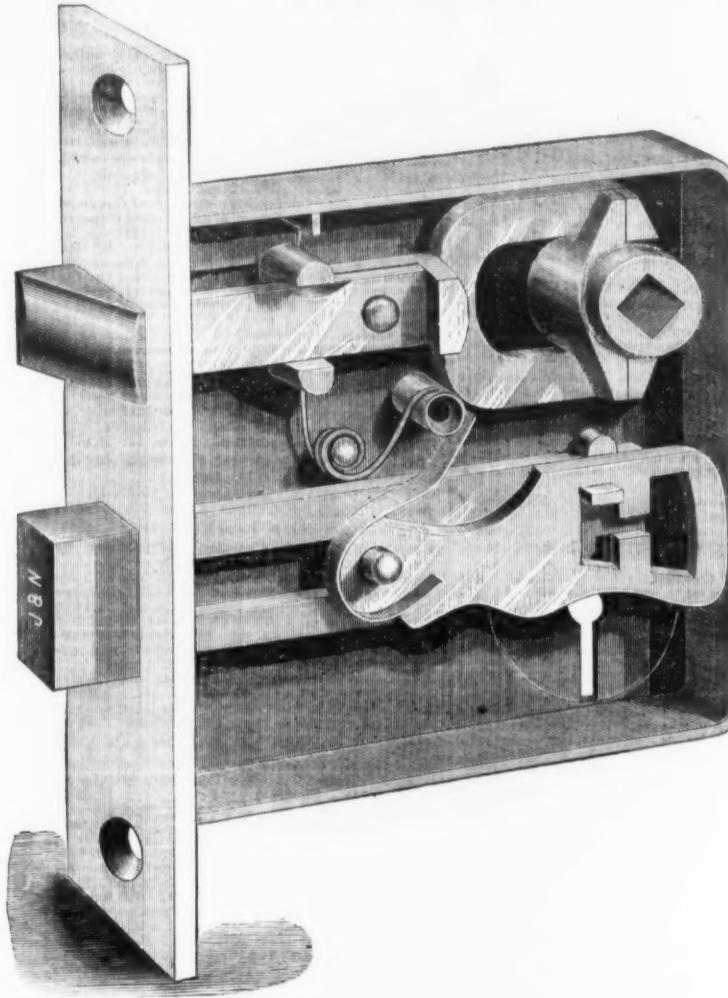
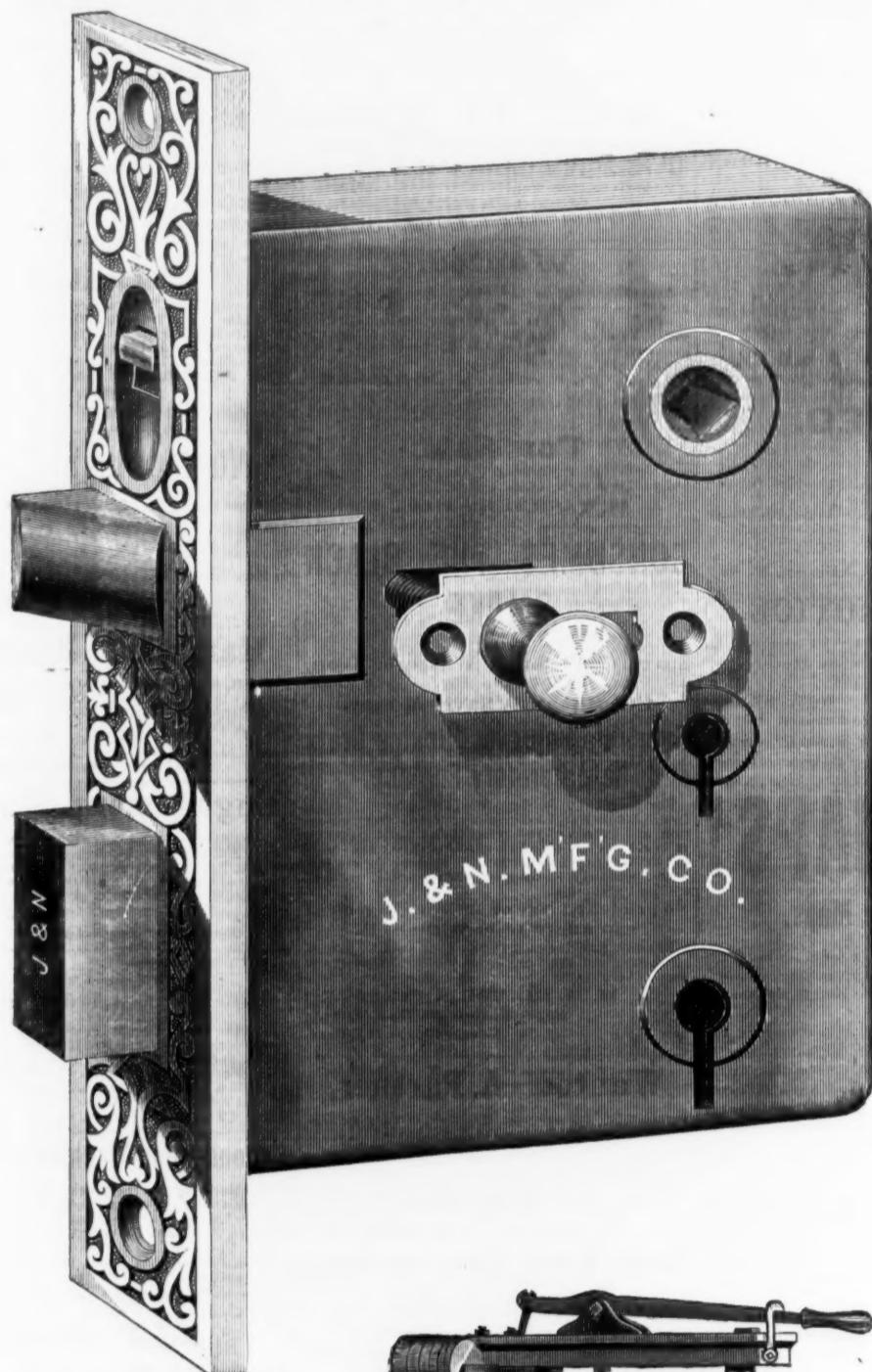
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FOUNDED A. D. 1833.

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Works and Office, DIAMOND STREET, PITTSBURGH, PA.

MANUFACTURERS OF

Door Locks & Latches, Scales & Coffee Mills, Genuine Bronze Builders' Hardware; also, Brass-Plated Rim & Mortise Locks & Latches.



We will issue an Illustrated Catalogue of 300 pages, including all goods of our manufacture, together with our **REVISED PRICE LIST**, on or about June 1st next, which can be had on application, or from any of the following firms who represent us:

GRAHAM &amp; HAINES, 113 Chambers St., New York.

ARTHUR EMORY, 9 German St., Baltimore, Md.

CHAS. M. MILLER, 409 Commerce St., Philadelphia, Pa.

Hill's system of wrought iron permanent way consists in the employment of longitudinal sleepers of rolled iron, to which the rails are connected by screw bolts, in combination, however, with cross sleepers, also composed of rolled iron. The cross sleepers are arranged either under the joints of the longitudinal sleepers—in which case the fish joint of the rails will be over the cross sleeper—or one cross sleeper may be employed at each end of each pair of longitudinal sleepers, leaving the necessary space for packing with ballast between the two adjacent cross sleepers. In this latter case the joints will be what is generally called suspended joints, same as are now mostly employed in ordinary permanent way. Mr. H. Simon, of Manchester, England, has recently issued a short description of this system, in which it is stated that 1000 miles of permanent way have been laid down.

### Special Notices.

### Special Notices.

### THE IRON AGE BOOK DEPARTMENT.

DAVID WILLIAMS,  
83 Reade St., New York.

The following standard works, of especial interest to our readers, will be sent, postpaid, on receipt of price:

BLOXAM CHAS. L.—*Metals—Their Properties and Treatment*: Contains: Properties Distinguishing the Useful Metals as a Class—Iron and Steel, Copper, Tin, Zinc, Lead, Silver, Gold, Mercury, Platinum, Palladium, Bismuth, Aluminum, Magnesium, Cadmium. Price. \$1.75

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BYRNE—*Handbook for the Artisan, Mechanic, and Engineer*: Comprising the Grinding and Sharpening of Cutting Tools, Abrasive Processes, Lapidary Work, Gem and Glass Engraving, Varnishing and Lacquering Apparatus, Materials and Tools for Grinding and Polishing, etc. By Oliver Byrne. Illustrated by 185 wood engravings. In one volume, 8vo. \$5.00

BYRNE, The Practical Metal Worker's Assistant: Comprising Metallurgical Chemistry; the Arts of Working all Metals and Alloys; Forging of Iron and Steel; Hardening and Tempering; Melting and Mixing; Casting and Founding; Works in Sheet Metal; the Processes Dependent on the Ductility of the Metals; Soldering; and the most Improved Processes and Tools employed in the Metal Works. With the Applications of the Art of Electro-Metallurgy to Manufacturing Processes, collected from Original Sources, and from the works of Holtzapfel, Bergeron, Leopold, Plummer, Napier, Scoffern, Clay, Fairbairn and others. By Oliver Byrne. A new, revised and improved edition, to which is added an Appendix, containing the Manufacture of Russian Sheet Iron. By John Percy. M. D., F. R. S., and Manufacturer of Malleable Iron, Castings and Implements in Brass and Steel. By A. A. Fesquet, Chemist and Engineer. With over 600 Engravings, illustrating every branch of the subject. 8vo. \$7.00

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Hardware.	Steel.
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Casks, 2	Cases, 1
Boker Hermann & Co.	Doyle Alfred, Wire, cks., 2
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Barrels, 7	Cases, 1
Grubb Jos. E. & Co.	Bundles, 20
Pew. cases, 4	Scrap railway spring,
Hodgkinson & Haigh,	lots, 1
Empty cartridge cs.,	Scrap
cs., 6	railway
Gun caps, cs., 2	spring,
Harmar Wm. & Co.	Cases, 1
Casks, 2	Bars, 16
Hurst F. W. J.	Sanderson G. & Co.
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Lalance & Grosjean,	Wire, bales, 131
Mds., pkgs., 1	Wire, coils, 2
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Mason J. W. & Co.	Order,
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Moore's John P. Sons,	Bundles, 49
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Scrap, tons, 73	Naylor & Co.
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Bars, 1469	Phelps Dodge & Co.
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Bundles, 768	Black taggers, bxs., 212
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Blooms, 436	Tin, ingots, 401
Naylor & Co.	Black taggers, bxs., 10
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Spiegel, tons, 120	Lead, pigs, 2888
Phelps, Dodge & Co.	Tin, stabs, 360
Sheet, bundles, 295	Tin and terne plates, bxs., 980
Order,	
Spiegel, lots, 1	
Bars, 909	
Spiegel, tons, 111	
Casks, 45	

## PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., Philadelphia, May 8, 1877.

**Pig Iron.**—The market is quiet and steady, with about the usual moderate demand, and at prices recently current. Holders seem to be anxious about finding a market, and the tendency is generally toward greater firmness. There cannot be much improvement, however, until the conviction becomes general that bottom prices have at last been reached. In our last report we gave some reasons tending to show that further important decline was, to say the least, improbable if not impossible. Labor at seventy-five to ninety cents per day—the rate now paid at the furnaces—certainly cannot, with the present food prospects, be reduced much further. There does not appear to be much margin for reduction in other directions, and it would seem, therefore, that prices have at last found a bottom, and if this opinion is shared by consumers, it will not be long before a reaction takes place. There is a moderate and, we think, increasing consumption of iron going on, but the trade have become so used to a declining market that confidence is entirely lost, and all that sellers seem to hope for is that things will not get worse. The Glendon Iron Company, to whose circular we referred last week as soliciting orders for their product for the current year, have, up to this writing, placed 14,500 tons, with every prospect of its reaching 20,000 tons in the course of a few days. We do not see that it has materially affected the market so far, although the opinion is expressed that it will compel some who have been competitors to reduce their figures, or lose their market. So far, however, as we said before, it does not seem to have had that effect, as general quotations are about the same as last week. We quote No. 1 Foundry, \$19 to \$19.50; No. 2 do., \$18, and Gray Forge, \$17.50 to \$18, with occasional lots sold above and below these figures. A sale of 2000 tons of No. 2 Foundry was made a few days ago, but price is kept private, although it is understood to be considerably below the average quotation.

**Blooms.**—The demand continues good, and strictly Cold-blast Charcoal Blooms are firm and somewhat scarce. We quote: Sunken Scrap Blooms (2464 lbs.), \$42 to \$45; Northern Ore Blooms (2240 lbs.), \$38 to \$42; best quality Charcoal Billets (2240), for wire and steel purposes, \$52.50 to \$55; Bars, ditto, \$65 to \$67.50; Sheet Iron Blooms, cornered (2464 lbs.), \$65 to \$67; Cold-blast Charcoal Plate Blooms, \$57.50 to \$60; run out Anthracite, \$50 to \$52.50.

**Bars.**—The situation is not materially changed since our last report. Inquiries are rather more numerous, and if it were not for outside competition a fair amount of business could be done. For some reason or other there has been a heavy pressure from Western mills to realize on their stock, without much regard to price, which, of course, has seriously interfered with the business of our local mills.

How Western manufacturers can deliver Iron in this market, at prices which, according to their own statement, are less than cost of production, is something that cannot be satisfactorily explained, and yet this is what some of them are doing. We have a variety of prices for Bars manufactured at the mills in this city, but buyers understand perfectly well that quality is in proportion to price, with a strong probability that the lowest priced Iron leaves the largest margin of profit to the manufacturer. It is assumed, therefore, that the quality of the Iron brought from a distance, and sold at these low prices, is of an inferior quality, but if not, the business will soon come to an end, as the loss on a good quality of Iron would be very serious. There is no doubt, however, that the general condition of business is very unsatisfactory, and until the demand and consumption of Iron become greater, competition of this character may be expected. We continue our quotations of last week, say, 2-1c. to 2-2c. for first-class brands, and common Iron down to 1-90c. to 1-90c.

**Plate and Tank Iron.**—The demand continues to be of fair proportions and sufficient to keep the mills pretty well employed, although it is said orders have been taken at very low figures. Competition is quite as keen in this branch of the Iron trade as in any other, and in order to secure business low prices have to be accepted. The demand is of a general character, and the consumption for shipbuilding, car building, boilerwork and repairing is steady and continuous, with satisfactory prospects for the immediate future. We quote: Tank Iron, 23c.; to 24c.; Ship Plates, 24c.; Clute Iron, 24c.; Flange Iron, 3c. to 4c.; Best Bloom, 6c. to 61c.

**Sheet Iron.**—The market shows no special change; prices are irregular and weak, and the demand dull and disappointing. We quote about 3c. to 3-1/2c., according to quantity and quality.

**Muck Bar.**—We do not hear of any recent transactions, but \$94 to \$36, Philadelphia de- livery will be a fair quotation.

**Steel Rails.**—The demand continues light, and the feeling is rather weak, although quotations are nominally unchanged. Sales of 6000 to 8000 tons have been effected during the past few days, but, as the prices are kept strictly private, it is probable that they are somewhat below the regular quotations. The market has a downward tendency, and there is little doubt but important concessions would be made to secure a good cash buyer. The nominal rate is still \$48 to \$49 at mills, but we do not hear of actual sales at these figures.

**Iron Rails.**—There is no change to note either in price or demand. Inquiries are frequent, and if sellers would accept bonds as collateral, a large business could be done. The disposition is to sell for cash only, or undoubted security; hence but few actual transactions are reported. We quote \$33 to \$36 at mills, with sales in small lots at medium figures, price according to quality.

**Old Rails.**—There is less demand, and, with increased offerings, prices are easier, sales were made some days ago at \$21, but they are now offering at \$20.50, with no disposition to buy largely. We quote \$20 to \$21, which would now cover the extreme range. Market dull and weak.

**Old Car Wheels.**—are still nominal at \$18.50. Holders ask higher prices, but we do not hear of any recent transactions.

**Old Car Axles.**—No recent transactions are reported. There are buyers at \$29, with some holders asking higher prices.

**Scrap Iron.**—There has been a fair business at reduced quotations, and the market is steady at \$15 to \$17 for Casts, and \$23 to \$25 for Wrought. Sales chiefly at intermediate figures.

**Nails.**—continue unsettled in price, although the demand is a trifle better. We quote \$2.60 as the nominal rate, with sales in quantity at some reduction.

**Tin Plates.**—The demand continues to be satisfactory, and although no change in prices can be reported, the feeling is one of timeliness. We quote, jobbing lots: I. C., 10x14, Best Charcoal Bright, \$7.50 to \$8; I. X., 10x14, \$9.75 to \$10.25; Best Charcoal Leaded, 28x20, \$14 to \$14.50; good Charcoal Leaded, 28x20, \$14 to \$14.50; good Charcoal Leaded, 28x20, \$13.75; other good brands, \$12.50 to \$13.25; good Bright Tin for Cans, &c., \$6.50 to \$7.25; Coke Leaded, 14x20, \$6 to \$6.50.

## PITTSBURGH.

Office of The Iron Age, 77 Fourth Avenue, Pittsburgh, May 8, 1877.

**Pig Iron.**—There is a fair consumptive demand, taking everything into consideration, but trade is far from being what it should be, and usually is, at this season of the year. The mills are buying just as little as they can help, being determined to carry no more stock than is absolutely necessary, and the indications are that this hand-to-mouth policy will be closely adhered to for some time to come. While the tone of the market continues weak, prices, as compared with last week, have undergone no notable change. Good Red-shorts are still held with considerable firmness, while Cold-short and Neutrals are weak, with concessions being offered to effect sales, and no demand, except to supply actual necessities. Bituminous Coal and Coke Irons are quoted as follows: No. 1 Foundry, \$24, 4 months; No. 2 do., \$22.50 to \$23; Gray Forge, \$21.50 to \$22 for Red-short and \$20 to \$21 for Cold-short and Neutrals. Sales of Anthracite Gray Forge at \$18 to \$19 for Cold-Short and Neutrals.

**Manufactured Iron.**—The general position of the market remains about the same as noted from week to week for some time past, with the exception that the much vexed question of labor is beginning to loom up again, and at present is one of the principal topics of discussion in Iron circles at the present time. The compact entered into by the

manufacturers and puddlers for one year expires 1st of June, and it is about as certain as anything can be that it will not be renewed, except at a material reduction, as it is claimed that the price paid here for puddling is \$1 per ton more than is paid in the East. The existing scale stops at 2-1/2 cents, whereas iron is being sold at from 1/2 to 1/4 of a cent per pound less, yet the cost of puddling is the same that it was when prices were up to 2-1/2 cents. As there was no provision made in the present compact to drop below a 2-1/2 cent base, the probability is that our manufacturers, as a body, will refuse to renew the present compact, and unless the puddlers submit to a reduction, which is not probable in view of the increased cost of living, each firm will be at liberty to make the best terms they can with their puddlers—to shut down or continue in operation as they see proper.

**Nails.**—The demand has fallen off somewhat, as it usually does at this particular time, and the rush, we presume, may be considered over. There is no margin for profit at current rates, hence makers are not pressing business, and prices would have been advanced ere this but for Eastern competition, as Eastern manufacturers, it is reported, are cutting Western rates in the West. The regular May meeting of the Western Association takes place here this week, but in view of what has already been stated, it is not probable that there will be any change made in prices.

**Horze and Muleshoes.**—The demand continues rather light, as it usually is at this particular time, while prices remain unchanged. We continue to quote in 100 kg. lots at \$8.50 for former and \$4.50 for latter.

**Plate and Tank Iron.**—The market is quiet, and the feeling is that there will be no change.

**Petroleum.**—Nearly all the standard refineries were started up yesterday, and it is said that arrangements have been made to ship the refined to Baltimore over the Pittsburgh, Washington and Baltimore Road, which is owned and controlled by the Baltimore and Ohio Company. The standard managers, it would appear, are determined not to give the Pennsylvania Railroad any business until that corporation is willing to comply with the demands made by the former.

## BOSTON.

**MAY 5.**—**Pig** continues depressed, with no demand at all for future delivery, and a very small inquiry for spot lots. We quote \$23.50 to \$25 for No. 1; \$23 for No. 2, and \$22 to \$23 for Gray Forge. Scotch Pig is firmer. We quote \$27 to \$30 for store lots, these being the best figures that could be actually obtained. The foreign markets are cabled higher. Bar is dull, quoting \$47 to \$48 for Refined, and \$38 to \$39 for Common. Nails are in light demand, at the reduction. Copper has had the usual seasonal week's business. We quote 1-1/2 wide by 3/4 to 1 thick, 2-1/2 to 2-1/2 wide by 1-1/2 to 2 thick, 3-1/2 to 4 wide by 1-1/2 to 2 thick, 4-1/2 to 5 wide by 1-1/2 to 2 thick, 5-1/2 to 6 wide by 1-1/2 to 2 thick, 6-1/2 to 7 wide by 1-1/2 to 2 thick, 7-1/2 to 8 wide by 1-1/2 to 2 thick, 8-1/2 to 9 wide by 1-1/2 to 2 thick, 9-1/2 to 10 wide by 1-1/2 to 2 thick, 10-1/2 to 11 wide by 1-1/2 to 2 thick, 11-1/2 to 12 wide by 1-1/2 to 2 thick, 12-1/2 to 13 wide by 1-1/2 to 2 thick, 13-1/2 to 14 wide by 1-1/2 to 2 thick, 14-1/2 to 15 wide by 1-1/2 to 2 thick, 15-1/2 to 16 wide by 1-1/2 to 2 thick, 16-1/2 to 17 wide by 1-1/2 to 2 thick, 17-1/2 to 18 wide by 1-1/2 to 2 thick, 18-1/2 to 19 wide by 1-1/2 to 2 thick, 19-1/2 to 20 wide by 1-1/2 to 2 thick, 20-1/2 to 21 wide by 1-1/2 to 2 thick, 21-1/2 to 22 wide by 1-1/2 to 2 thick, 22-1/2 to 23 wide by 1-1/2 to 2 thick, 23-1/2 to 24 wide by 1-1/2 to 2 thick, 24-1/2 to 25 wide by 1-1/2 to 2 thick, 25-1/2 to 26 wide by 1-1/2 to 2 thick, 26-1/2 to 27 wide by 1-1/2 to 2 thick, 27-1/2 to 28 wide by 1-1/2 to 2 thick, 28-1/2 to 29 wide by 1-1/2 to 2 thick, 29-1/2 to 30 wide by 1-1/2 to 2 thick, 30-1/2 to 31 wide by 1-1/2 to 2 thick, 31-1/2 to 32 wide by 1-1/2 to 2 thick, 32-1/2 to 33 wide by 1-1/2 to 2 thick, 33-1/2 to 34 wide by 1-1/2 to 2 thick, 34-1/2 to 35 wide by 1-1/2 to 2 thick, 35-1/2 to 36 wide by 1-1/2 to 2 thick, 36-1/2 to 37 wide by 1-1/2 to 2 thick, 37-1/2 to 38 wide by 1-1/2 to 2 thick, 38-1/2 to 39 wide by 1-1/2 to 2 thick, 39-1/2 to 40 wide by 1-1/2 to 2 thick, 40-1/2 to 41 wide by 1-1/2 to 2 thick, 41-1/2 to 42 wide by 1-1/2 to 2 thick, 42-1/2 to 43 wide by 1-1/2 to 2 thick, 43-1/2 to 44 wide by 1-1/2 to 2 thick, 44-1/2 to 45 wide by 1-1/2 to 2 thick, 45-1/2 to 46 wide by 1-1/2 to 2 thick, 46-1/2 to 47 wide by 1-1/2 to 2 thick, 47-1/2 to 48 wide by 1-1/2 to 2 thick, 48-1/2 to 49 wide by 1-1/2 to 2 thick, 49-1/2 to 50 wide by 1-1/2 to 2 thick, 50-1/2 to 51 wide by 1-1/2 to 2 thick, 51-1/2 to 52 wide by 1-1/2 to 2 thick, 52-1/2 to 53 wide by 1-1/2 to 2 thick, 53-1/2 to 54 wide by 1-1/2 to 2 thick, 54-1/2 to 55 wide by 1-1/2 to



have been made for a supply of about 3000 bushels daily.

The first shipments of iron ore from Escanaba this season were made last week. The following figures show the amount forwarded up to Thursday, the 3d instant:

	Gross Tons.
Mine	4,697
Jackson	569
Barnum	173
Salem	173
Lake Superior	1,129
Cambridge	1,235
Total	7,795

—*Mining Journal*, May 5th.

ILLINOIS.

Centralia has concluded to build a rolling mill for making merchant iron, hoops and nails. This is to be a co-operative mill where "The sons of Vulcan may toil and rise to fame and honor."

#### Fire-Proofing Wooden Buildings.

In a recent issue, says *Iron*: The value of Messrs. Evans and Swain's method of fire-proof building, whereby a return to timber construction, under certain conditions, is advocated, was practically tested last week.

In furtherance of the test, the inventors had a structure run up in 14 inch brickwork on the vacant ground on the Thames embankment, near Blackfriars Bridge, and on which was laid a test floor on their principle.

The test floor measured 14 feet by 14 feet in the clear, and was composed of battens or joists 7 inches deep by 2½ inches thick, spiked together. The floor was here formed by the top edges of the battens, but floor boards can be laid where desired. The interior of the brick structure carrying the flooring was 7 feet high from ground to ceiling, and it had an arched entrance 4 feet wide on one side, and four 9 inch by 6 inch air gratings in two other sides for draught. One-third of the floor was left plain underneath, a second third was plastered, the key being formed by dove-tail grooves in the wood, while the remaining third was plastered, the key here being formed by nails half driven. The cracks between the joists were grouted with fine plaster. After standing for about ten days, subject to the recent changeable weather, and the work being still green, the floor was put to the fire test. On one day during the week four loads of timber were heaped in the structure and set on fire at 10 o'clock. In a very short time there was a fierce furnace blazing in the building, which for a long time had no perceptible effect on the floor, which externally remained cool. At 12:35, however, smoke and flame began to issue through the joints of that portion of the floor which was unprotected by a plaster ceiling, and by 1 o'clock there were signs of leakage of steam and smoke in other parts. A little earth was strewn on these joints, which no doubt were defective through having been badly grouted. By 1:30 the wall showed a considerable bulge at the side where the flooring was unprotected, and the fire crept up between the brickwork and the flooring. By 3 o'clock, after five hours' trial, the fire had fairly got hold of the unprotected flooring, and a portion of it fell in. It was, of course, useless to expect that the remainder of the woodwork could stand as the flames ate into it sideways, bringing down batten after batten. About 3:30 a fire engine arrived, and after about an hour's work the fire was got under. The only portion of the floor left was that third to which the plaster was attached by nails and three battens of the dovetailed portion. This remnant of flooring was about 6 feet wide, and as soon as the fire was got under it was loaded in the center with about a ton and a half of granite pitching stones, which weight it bore, as well as that of two men who were loading the same on. The base of the pile of stone was 4 feet square, and the load was subsequently increased to three and a half tons, under which weight the flooring gave way. It was then ascertained that the under side of the flooring was charred through for a depth of about 4 inches, leaving 3 inches of sound timber. To test and compare the action of the fire on iron and wood, an ordinary seven inch rolled iron joist had been placed on supports inside the building directly over the fire and within a foot of the ceiling, a weight of about 3 cwt. being placed on its center. After being exposed for about one hour in the flames the iron joist became bent and twisted and finally toppled over into the fire in a crippled condition. It will thus be seen that the timber flooring was exposed to such an intense heat and under such conditions as it is hardly possible to imagine could occur at an ordinary fire. In the event of a fire breaking out in any building, in no case would a floor or ceiling be subjected for five or six hours—or even for one hour—to the action of such flames as played upon the experimental floor in question without any attempt being made to subdue them. It is to be observed, moreover, that these results were obtained with a floor of the lightest form—that designed for ordinary rooms—and yet a good margin of safety remained. For public buildings and warehouses the thickness would be ten inches, or even eleven inches, thus greatly increasing the strength and adding to the security. Considering the intensity of the heat developed, the proximity of the fire to the woodwork, and several imperfections in the brickwork, the flooring may be said to have stood its ground exceedingly well.

The Union Thugs at Troy.—John McKeever, a non-union moulder at the Clinton Foundry, was attacked by three men on Jefferson street, Tuesday morning, each of whom fired on McKeever, all the shots taking effect.

One of the shots entered back of one of his shoulders, and passed through the right lung, being extracted at the breastbone; the other shot inflicted flesh wounds in his hip and breast. He cannot recover. His assailants escaped, owing to the cowardice of a special officer.

#### Banking by Water-Power.

The history of the Manhattan Bank, of this city, is interesting, as showing how the city was supplied with water and banking facilities by one and the same corporation, before Croton was introduced. Mr. Harberger, cashier of the Manhattan Company, tells the following story:

Until 1812 or 1813 the law of this State was such that it was impossible to procure a charter for a bank, notwithstanding the fact that vast amounts of capital were ready to embark in a business which offered such glittering inducements. But the ingenuity of the capitalists in a few cases evaded the law, and to this New York owes the existence of several of its leading moneyed institutions. In 1798, Aaron Burr, who had not long before occupied a seat in the Senate of the United States, became a State Senator. He was then, probably, the leading member of the New York bar, and his eminent talents as well as the lofty position he had attained in the State, made him well known among moneyed men to whom he had been extremely useful during his senatorial career. It may be added, too, that Mr. Burr's immense fortune, inherited from his father, was still nearly intact, and that he was seeking investment for his surplus cash. Hence, one of his first efforts after assuming his new position was to frame a charter cleverly evading the banking law. It incorporated "The Manhattan Company of the city and county of New York, for the purpose of supplying pure and wholesome water for the city of New York, and for other purposes." In the absence of the records of the Legislature of 1798-9, it is impossible to say whether there was any opposition to the last specious clause or not, but it is fair to presume that there was, since another clause was inserted invalidating the charter in case the company, at any time, ceased to supply water.

The charter was signed in 1799, and the company began at once to dig wells and lay pipes in the lower part of the city. While the work was going on, they availed themselves of the special clause in the charter, and established a banking house, which has survived the many financial storms of three-quarters of a century, and is known to-day as one of the most solid and conservative institutions in the country. Over its door, 40 Wall street, are the words "Manhattan Company," but in business circles it is always spoken of as the Manhattan Bank.

How much pipe was laid, or in what streets, cannot be ascertained; but it is known that for many years the only supply of water, other than that drawn from private wells, came from the reservoir of the Manhattan Company, located at the corner of Reade, Elm and Center streets. The well and reservoir are still there, but are hidden from sight by a brick building belonging to the company and leased to the estate of the late A. T. Stewart.

The old well is 19½ feet in diameter and 31 feet deep, and has 14 feet of water. The reservoir is 45 feet in diameter and 39 feet deep, and is of heavy sheet iron. It stands upon a circular tower of massive masonry, which was evidently built to outlast even the charter of the company. From being scarcely half a century ago, the main source of the water supply for the city, the old well and reservoir have come at last to be the feeders of a single engine. Still, for obvious reasons, the company keeps them in repair, and a clause in the lease prohibits their demolition.

"We've had a pretty hard time of it with that Croton Department," said Mr. Harberger. "Along about 1838 they began to take our customers away, and in 1840 we had only twelve left. Still, we kept up the fight, although we saw they were pushing us hard. In 1840 we had only one customer to supply. He was a livery stable keeper, and had a constitutional objection to changing water. Well, we kept right on, in spite of Croton, until finally the livery stable man died and we lost him. Since that our only customer has been a steam engine up in Reade street.

"It's the longest and pluckiest fight on record, isn't it? Our last 13 customers cost us about \$800,000! Did we keep running on account of that clause in our charter? Well, people might think so, but we always say we want to hand down the company to our successors just as we found it. The other day one of our oldest depositors brought us in a piece of one of the old pipes and wanted us to keep it as a relic. We did keep it three days. Then we asked the old gentleman as an act of charity to take it back again. Relics are good enough, you know, but that was rather unsavory."

A singular fact about the old well is that the Croton Department did not know of its existence until within a year or two. Then a collector who tried to collect the water rent for the engine in the building which covers it, found out that no Croton was used, and reported accordingly.

The bank officers say that the well shall never cease to supply somebody, even if they have to fill it with buckets.

An auction sale took place at the Brooklyn Navy Yard on the 4th instant of 300,000 pounds of old chain, the torpedo boat Midge, captured at Charleston, S. C., and a quantity of other condemned articles. The Midge has occupied a conspicuous position in front of the Commodore's quarters for several years. It always attracted the attention of visitors at the Navy Yard from its associations and its peculiar construction. It is about 49 feet in length, shaped like a double pointed cigar, and furnished with an engine and propeller. It was intended to carry a can torpedo at the end of a bar running about 20 feet from the prow. It is not known that this vessel was ever in use for war purposes, but others of the same construction were employed by the Confederates,

one of which sunk the gunboat Housatonic. Another was sent from Charleston to Mobile, previous to the taking of that city, for the purpose of destroying the monitor Manhattan, which played a conspicuous part in the operations against Mobile, and destroyed the rebel ram Savannah. The officers of the torpedo boat when ordered down the bay to destroy the Manhattan did not refuse to obey their orders, but intentionally disabled the machinery, which was speedily repaired, and orders were again given to attack the Manhattan. It was agreed that, rather than risk their capture by the enemy, who they were assured would hang them, they would cause an explosion of the boiler, which programme was carried out, causing the death of the engineer and one other person, while the captain was taken prisoner. Another of these torpedo boats was sunk in the harbor of Charleston, destroying all on board. The sale began at 11 o'clock, and the Midge was sold to James T. Powers & Co. for \$250. The iron chain brought 1½ cents a pound.

#### Working Furnaces on Sunday.

Mr. John Gritton, of the Lord's Day Observance Society, of London, writes to *Iron* as follows:

At a meeting of the Iron and Steel Institute, in the autumn of last year, Mr. Snelius used the following words:

"As to dealing with the Sunday, this was a difficulty, but it was what they would have to come to, and, as the blast furnaces were so worked, he did not see why they should not make steel as well as pig iron on Sunday; but that was a delicate subject, and perhaps he had better not say much about it."

These words present to the mind a coming danger. There is sadly too much Sunday work at present, but an immense increase is threatened.

It would be greatly to the comfort of managers and workers, and eventually not at all to their detriment, if this anticipation could be falsified.

May I ask you to permit the insertion in your valuable and widely read paper of this letter, for the purpose of calling attention to the following communication on the subject, from Michigan? Some of the facts I have to accept on the word of my correspondent, in whose care and veracity I have every reason to trust. Some of them are corroborated by the testimony of a well known ironmaster in the Cleveland district, who has visited in person the Ashland Furnace and other points:

(1) Ashland Furnace, Ashland Railway, Douglas Putnam, manager and agent. Large furnace, forty or more tons a day, uses stone-coal, rests about fifteen hours out of the twenty-four. Mr. Douglas Putnam says: "The most successful charcoal furnace in this region always stops regularly on the Sabbath." He says, respecting his own, Ashland Furnace: "We have been running regularly on one hearth over twenty-four years, and see no sign of its giving out yet." The president of Ashland Furnace, John Means, says: "We stop our furnace every Sunday. Much more than one-half of the sixty charcoal furnaces in this region are stopped Sunday."

(2) Pine Grove Furnace, in Ohio, has run for forty years on Sabbath-keeping principles, and has been very successful. The manager, A. R. Macintosh, says: "The results are entirely satisfactory to the company." For the amount of business done, Pine Grove is run with less men than any other furnace in Southern Ohio." The only serious trouble in stopping any furnace—stonecoal, or other—is to get a founder that is willing to give the thing a fair and impartial trial. This Pine Grove Furnace was the first to try the experiment in this country, and many thereabout do likewise.

(3) Olive Furnace, Ohio. William Harnay McGuinn, manager, says: "I have been connected with this furnace eleven years, and we have stopped every Sunday (with one or two exceptions) for eight years, and those exceptions were the founder's fault entirely, and not the owner's. It is an entirely erroneous idea that furnaces cannot be stopped on Sunday successfully. And it is really money in any furnace company's pocket to do so, beside having the advantage of better men and better workers. I am no religious man, but advocate the practice because it has proved a success."

I give you below the names of managers and furnaces that stop on Sunday: C. L. Nivins, Buckhorn Furnace, Laurence county, Ohio; Joshua Kelly, Center Furnace, Laurence county, Ohio; H. C. Amos, Etna Furnace, Laurence county, Ohio; John H. Campbell, McVernon Furnace, Laurence county, Ohio; W. H. McGugin, Olive Furnace, Laurence county, Ohio; A. R. Mackintosh, Pine Grove Furnace, Laurence county, Ohio; George Williams, Scotia Furnace, Scotia county, Ohio; John Davis Jefferson, Scotia Furnace, Jackson county, Ohio; and many others should you need them. Three furnaces have never run on Sunday, viz.: Jefferson Furnace, John D. Davis, manager, Oak Hill, Jackson county, Ohio; Cambria, W. W. Evans, manager, Jackson county, Ohio; and Pine Grove, Hanging Rock, Laurence county, Ohio.

(4) This Jefferson Furnace is a remarkable fact; a letter signed by the manager, John D. Davis, and the secretary and treasurer, agent and founder says: "This furnace was built in the spring of 1854, and has been running every year since, and it has not run one minute on the Lord's day since it has been in operation. We have all the work of stopping done before 12 o'clock on Saturday night, and we do not begin to draw steam until after 12 o'clock on Sunday night. The furnace gains back her heat by 7 or 8 o'clock on Monday morning." And much more of a similar nature. I have thus given you a few specimens of my testimonies

on this subject. I have many more; but if these are reliable they demonstrate our point that iron furnaces can run successfully and profitably rest on the Sabbath. And the testimony from various sources is that "the most successful ones are those that rest on Sunday," thus proving the truth of God's promise, "them that honor me, I will honor." The owners of Jefferson Furnace entered into a written compact before starting the furnace: "This furnace shall not run on the Sabbath under any circumstances whatever." And the manager says, "they have had no accidents worth mentioning (twenty-one years), and have made money as fast as any other furnace of its size."

One manager says, "We do not claim that we can make as much iron in six days as we could in seven, but in the long run—a year—the Sabbath-keeping furnace makes more than those who do not rest." Another says: "We more than make up during the week what we lost." Why, how can this be? Because they have the favor and blessing of God, without which our labor is vain.

It may be that the perusal of these notes on matters beyond the Atlantic, will engage the attention of ironmasters, and the more so because no inconsiderable portion of British money and skill are now seeking outlets and return in the iron and coal fields of the new world.

**Steel in Two Processes.**—We have received these from Messrs. Rees & Wilder, of Chattanooga, Tenn., samples of a razor and pocket knife made from the magnetic ore. The blades of this cutlery are only two removables from the ore, the ore being worked in a "Catalan" fire and hammered directly into a bar of wrought iron. The wrought bar is then melted in a crucible, and the steel is thus produced. The ore from which this cutlery is made is from the magnetic ore belt of Iron Mountain, on the line between Carter county, Tennessee, and Mitchell county, North Carolina, and is locally known as the Cranberry vein. From such tests we have been able to make in the way of practical use we find the quality quite as good as the average of cast steel employed in fine cutlery, if not better.

A type foundry in St. Paul has lately furnished the types for the *Framwari*, an Icelandic newspaper to be published in the Icelandic colony at Keewatin, on the Red River, in British territory, about sixty miles from Fort Garry. This will be the first newspaper published on the American continent in the Icelandic language. The preparation of the types required the greatest care. They are in the Roman alphabet, but with a great many peculiarities in regard to accentuation, and are of a very antiquated form. The Icelandic language is something like the Norwegian language as it was spoken about a thousand years ago.

Mr. W. P. Ward, proprietor of the Diamond Furnace, states that the Weimer high speed blowing engine now employed has settled down to a regular working speed of 110 revolutions per minute, and continues to "work to a charm." This is undoubtedly the first furnace blowing engine that has ever attained this speed, though even this is not the maximum capacity, as the mate to this engine employed in blowing the cupolas of the Weimer Works is frequently run up to 180 revolutions per minute.

The Cincinnati Bridge Company have recently closed a contract for two iron bridges in Knox county, Ohio, and are building an iron bridge for 150 feet span across San Jacinto River for the Houston, East and West Texas Railway Company.

#### The Coal Market.

##### Anthracite.

PRICES FOR MAY.

	Lump.	Stonner.	Broken.	Egg.	Stove.	Chestnut.
PENNSYLVANIA COAL CO., at New York, 40 cents per ton additional. Deliverable at Weehawken.	3-10	3-10	3-10	3-10	3-10	3-10
Pittston	3-10	3-10	3-10	3-10	3-10	3-10

Auction prices. 3-97 2-92 2-95 2-93 3-48 3-26

PRICES FOR MAY.

PA. PARDEE CO., 111 Broadway, Room 34.—F. o. b. at

Perth Amboy and Hoboken.

Hazleton, Sugar Loaf, Lat.

L. C. Coal Co., Lehigh

Lehigh Coal Co., Lehigh

# TACKS, LINING, SADDLE NAILS

UPHOLSTERS, GIMP, CARPET, CIGAR BOX, FINISHING, CHAIR NAILS, BRADS AND CHAIN, SHOT NAILS, AND SHOE TACKS, BRASS, SILVER, AND JAPANNED, SADDLE NAILS, COFFIN TACKS, TUFTING AND NAILS OF ANY COLOR.

AMERICAN TACK CO. Factory at Fairhaven, Mass. N. Y. Salesroom, 117 Chambers Street.

COMMON, CHISEL POINTED, AND COPPER BOAT NAILS. ANY SIZE OR STYLE OF TACK OR NAIL MADE FROM SAMPLE TO ORDER.

NATIONAL  
Horse Nail Co.  
MANUFACTURERS OF  
FINISHED  
(BRIGHT OR BLUED)



These nails are made of the best brands of NORWAY IRON, and are guaranteed to be equal to any in the market.

NATIONAL HORSE NAIL CO.,  
VERGENNES, VT  
HORACE DURRIE & CO., Agents,  
No. 97 Chambers St., New York.

## L. COES' Genuine Improved Patent SCREW WRENCHES.

Manufactured by

L. COES & CO.,  
Worcester, Mass.

Established in 1859.  
Registered March 31, 1869.



We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called "reinforced or jag bar." Also our enlarged jaw, made with ribs on the inside, having a full bearing on the front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use), verifies our claim that we are manufacturing the strongest Wrench in the market.

We would also call attention to the fact, that in 1869 we made several important improvements (secured by patents), on the old wrench previously manufactured by L. & A. G. Coes, which were at once closely imitated and sold as the *Genuine Wrench* by certain parties who seem to rely upon our improvements to keep up their reputation as manufacturers, and although the fact of their imitating our goods may be good evidence that we manufacture a superior Wrench, we wish the trade may not be deceived on the question of originality. Trusting the trade will fully appreciate our recent efforts, both in improvements on the Wrench and in the adoption of a Trade Mark, we would caution them against imitations. None genuine unless stamped.

L. COES & CO."

Warehouse, 97 Chambers St., & 31 Reade Sts., N. Y.  
HORACE DURRIE & CO., Sole Agents.



## THE AMERICAN WIRE NAIL CO.

Manufacturers of

Molding, Trimming, Upholstering & Finishing Nails.  
Escutcheon Pins and Wire Nails

Of all kinds and sizes, with Flat, Oval, Depressed, or Countersunk Heads, with or without points.  
Warranted Well Made and of Superior Quality.

OFFICE AND WORKS, Covington, Ky.

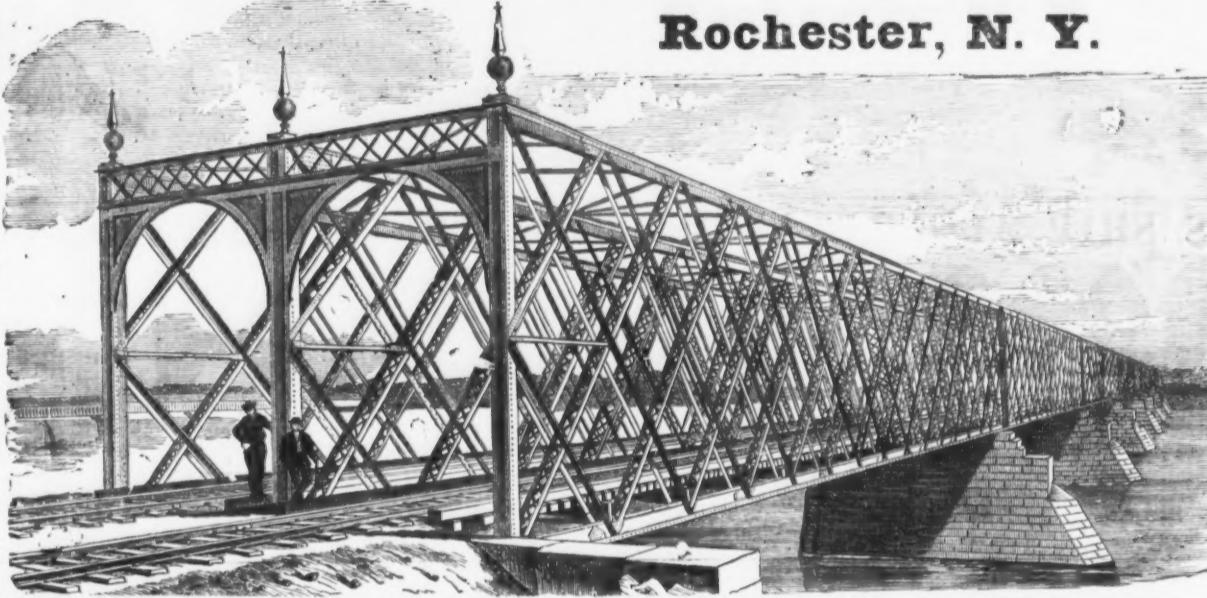
BRADS AND CHAIN, SHOT NAILS, AND SHOE TACKS, BRASS, SILVER, AND JAPANNED, SADDLE NAILS, COFFIN TACKS, TUFTING AND NAILS OF ANY COLOR.

AMERICAN TACK CO. Factory at Fairhaven, Mass. N. Y. Salesroom, 117 Chambers Street.

COMMON, CHISEL POINTED, AND COPPER BOAT NAILS. ANY SIZE OR STYLE OF TACK OR NAIL MADE FROM SAMPLE TO ORDER.

## LEIGHTON BRIDGE AND IRON WORKS,

Rochester, N. Y.



Wrought Iron Riveted  
Lattice Railroad  
AND  
HIGHWAY BRIDGES.  
Wrought Iron  
WATER PIPE.

The most economical and durable Pipe manufactured for Water Works, Oil Lines or Gas Mains.

### General Riveted Work

Orders Solicited from Civil Engineers  
and Contractors.

[Accompanying engraving represents the Springfield Bridge, built by the Leighton Bridge and Iron Works.]

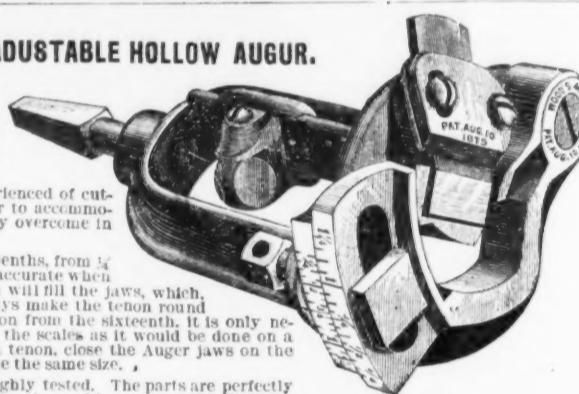
### WOOD'S PATENT ADJUSTABLE HOLLOW AUGUR.

The knife has an independent lip, and only requires resetting when sharpened. The jaws of this Augur are Steel Castings. The knife and adjusting bolt and nut are forged from the best refined Cast Steel.

The difficulty heretofore experienced of cutting any and every size, in order to accommodate variation in bits, is entirely overcome in this Augur.

The scales are laid off in sixteenths, from  $\frac{1}{16}$  to  $\frac{15}{16}$  inches, and are perfectly accurate when the knife is set so that the tenon will fill the jaws, which, having three bearings, will always make the tenon round and perfect. To cut any variation from the sixteenth, it is only necessary to make an allowance on the scales as it would be done on a rule. In repairing, to duplicate a tenon, close the Augur jaws on the old one and it will cut the new one the same size.

\* These Augurs have been thoroughly tested. The parts are perfectly duplicated, and the material and workmanship are guaranteed.



We offer this as the latest improved and best Hollow Augur in market. It will surely take the preference until something better is invented.

PRICE, \$4 each.

## MILLERS FALLS COMPANY,

No. 74 Chambers Street, NEW YORK.

HOWARD PARALLEL BENCH VISE.  
MANUFACTURED BY  
Howard Iron Works,  
Send for price list. Buffalo, N.Y.  
RUSSELL & ERWIN MFG. CO. NEW YORK & PHILADELPHIA AGENTS.

### THE EAGLE ANVIL!!

### WARRANTED!!



These Anvils are superior to the best English, or other Anvils, on account of the peculiar process of their manufacture (invented and used only by this concern), and from the quality of the materials employed.

The best English Anvils become hollowing on the face by continued hammering in use, on account of the fibrous nature of the wrought iron—causing it to "settle" under the face.

The body of the Eagle Anvil is of crystallized iron, and no settling can occur; the cast face, therefore, remains perfectly true. Also, it has the great advantage of being of a more solid material, and consequently with less rebound, the piece forged receives the full effect of the hammer, instead of a part of it being wasted by the rebound, as of a wrought iron anvil. An equal amount of work can, therefore, be done on this Anvil with a hammer one-fifth lighter than that required when using a wrought iron anvil.

The working surface is in one piece of JESUP'S BEST TOOLS CAST STEEL, which being accurately ground, is hardened and given the proper temper for the heaviest work. The face is covered with a thin, extremely fine *cast* iron.

The body of the Anvil is of the strongest grade of American iron, to which the cast steel face is warranted to be thoroughly welded and not to come off.

Price List, October 1st, 1870. ANVILS weighing 100 lbs. to 800 lbs. per lb.

Smaller Anvils (1/2 Minims.)

No. 00 10 lb. 15 lb. 20 lb. 30 lb. 40 lb. 50 lb. 60 lb. 70 lb. 80 lb. 90 lb.

Weighting about \$1.00 \$1.25 \$1.50 \$2.00 \$2.50 \$3.00 \$3.50 \$4.00 \$4.50 \$5.00 \$5.50

N. B.—These are the RETAIL PRICES. The only additional cost will be the freight to the purchaser's place of residence.

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trades).

New York.—Messrs. J. CLARK WILSON & CO.—RUSSELL & ERWIN MFG. CO.—Messrs. HORACE DURRIE & CO. Boston.—

Messrs. GEORGE H. GRAY & DANFORTH. Philadelphia.—Messrs. JAMES C. HAND & CO. Baltimore.—Mr. W. H. COLE.

Louisville.—Messrs. W. B. BELKNAP & CO.

FISHER & NORRIS, Sole Manufacturers, Trenton, N. J.

ESTABLISHED 1850.

WM. HASSALL,  
Manufacturer of  
American and French  
Wire Nails

With Flat, Round, Oval, Depressed, Screw and

Fancy Heads.

Molding and Finishing Nails, with or without heads. Brush Makers, Upholsterers' and Undertakers' Finishing Nails a specialty. Shoe Nails of Brass and Iron, Bright Iron Rivets, Brass and Iron Escutcheon Plaques, with flat, round and fancy heads, all sizes on hand to order.

OFFICE AND WORKS: Nos. 63 & 65 Elizabeth Street, New York.

### N.Y. MALLET and HANDLE WORKS



Manufacturers of

Calkers', Carpenters', Stone Cutters', Tin, Copper and Boiler Makers'

### MALLETS,

Hawking Beaters, Hawking and Calking Irons, all kinds of Handles, Sledge, Chisel and Hammer Handles, Also.

COTTON AND BALE HOOKS.

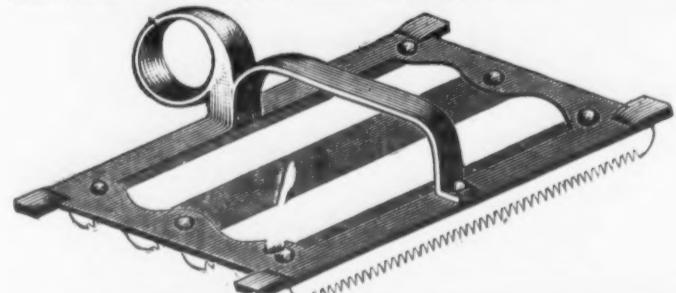
Patented Feb. 13, 1871; a new combination of Hooks.

156 E. Houston St., New York City.

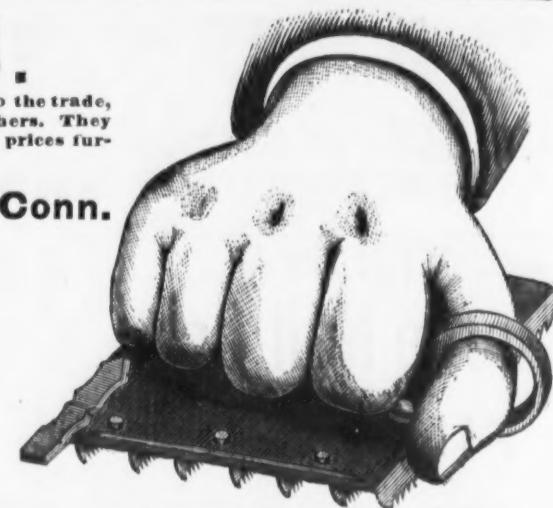
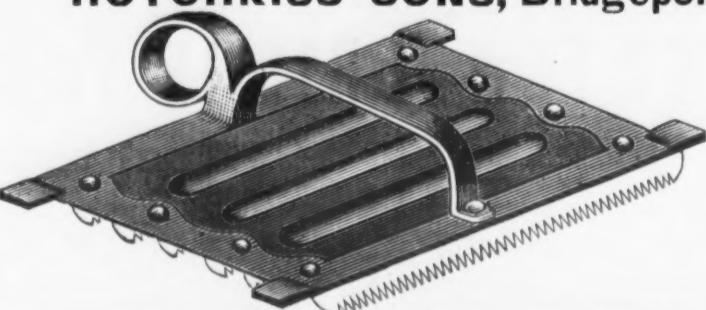
## HOTCHKISS' PATENT NOVELTY COMBS.

These Combs do not infringe upon the rights of any one. They are the Simplest, Neatest and Most Durable CURRY COMBS ever offered to the trade, affording an easy grasp for the hand, without the use of the ordinary side handle, and are universally acknowledged to be superior to all others. They are neatly put up in paper boxes of one dozen each, and packed 24 dozen in a case. For Sale by all the General Hardware Trade. Special net prices furnished on application.

Sample and Warerooms with  
GRAHAM & HAINES, 113 Chambers Street, N. Y.



Manufactured by  
**HOTCHKISS' SONS, Bridgeport, Conn.**



ILLUSTRATES THE GRASPING OF THE COMB.

**L'HOMMEDIEU'S SHIP AUGERS, AUGER BITS, TRENAIL AUGERS, PLUG BITS, Etc.**

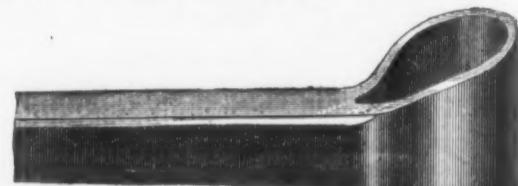


ALL GENUINE goods stamped L'HOMMEDIEU.

Manufactured by **E. H. TRACY.**

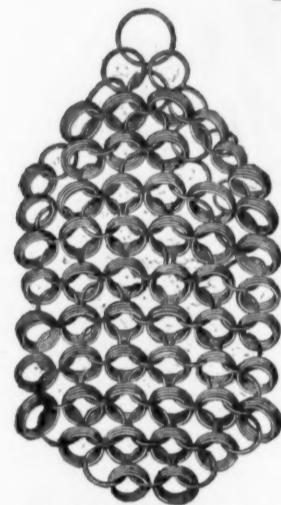
Made with or without sockets or rings. Extra length made to order.

For Bridge Building and Railroad Use they have no equal.



C. E. JENNINGS & CO.,  
Office, 98 Chambers St., NEW YORK.

## THE SPRAGUE NOVELTY WORKS.



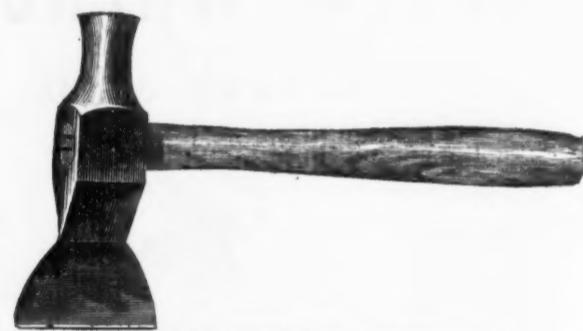
Wire Ring Pot Cleaners.

No. 1.....\$2.00 per doz.

No. 2.....\$3.00



Sprague's Ice Tool.  
Per doz., \$3.00.



Family Hatchet-Hammer.  
Per doz., \$3.00.

## THE WIRE RING POT CLEANERS

Are of the same pattern as has been heretofore imported from France, but we think ours to be much smoother and brighter goods.

**OUR ICE TOOL**, having been favorably known to the trade for the past two years, recommends itself; but it will be observed that we have reduced the price from \$4 to \$3 per dozen, which we are enabled to do by the depreciation of cost of materials used in its manufacture.

**THE FAMILY HATCHET-HAMMER** we recommend to the trade as the best and best selling tool of the kind now or ever known to the trade. While we offer it at a low price, still it is made from the best of materials, in first-class workmanship.

Send for our New Catalogue and Discounts. Address

**THE SPRAGUE NOVELTY WORKS, Rochester, N. Y.**

**Or W. M. ERNST, General Sales Agent,**

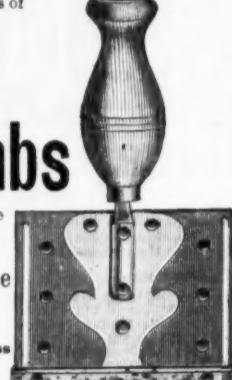
No. 26 Cliff Street, NEW YORK CITY.

**D. W. HAZLETON & CO.**

724 Girard Ave., Philadelphia

Manufacturers of

**Curry Combs**



Galvanized Square and Ornamental

Conductor Pipe

RIBBED TUBING

Stamped & Press Work to order.

Correspondence Solicited.

**DUPLEX Curry Comb**

We call the attention of Hardware Dealers to our Double Curry Comb, consisting of a Curry and coarse side; or vice versa, in one. It is unique, simple, and novel, and needs no argument to convince any one of its practicality. It sells on sight, and is bound to supersede all other combs. We want one reliable dealer in each State or territory to handle it. Correspondence solicited. Address

I. N. CASSELL, Frederictown, Ohio.

**CARRIAGE SPRINGS.**

JOHN H. RECK, PASSAIC SPRING WORKS,  
Manufacturer of Railroad Car, Locomotive, Omnibus Platform and every variety of Carriage and Buggy Springs.

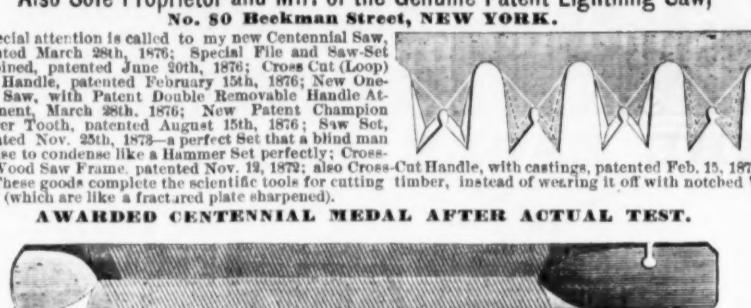
**E. M. BOYNTON,**

Manufacturer of all kinds of  
First-Class Saws, Saw Frames, Cross-Cut Handles, Tools, Files, &c.  
Also Sole Proprietor and Mfr. of the Genuine Patent Lightning Saw,

No. 50 Beekman Street, NEW YORK.

Special attention is called to my new Centennial Saw, patented March 28th, 1876; Special File and Saw-Set combined, patented June 20th, 1876; Cross Cut (Loop) Saw Handle, patented February 15th, 1876; New One-Man Saw, with Patent Double Removable Handle Attachment, March 28th, 1876; New Patent Champion Cleaver Tooth, patented August 15th, 1876; Saw Set, patented Nov. 25th, 1876; a perfect Set of Saws is now available, to compete with a French Set; also Cross-Cut Handle, with castings, patented Feb. 15, 1876. These goods complete the scientific tools for cutting timber, instead of wearing it off with notched teeth (which are like a fractured plate sharpened).

AWARDED CENTENNIAL MEDAL AFTER ACTUAL TEST.



PHILADELPHIA, November 11th, 1876.

REPORT ON AWARDS. GROUP NO. 15.

Product: Saws in great variety; special improvement in shape of teeth, called Patent Lightning Saw.

Name and Address of Exhibitor: E. M. Boynton, New York.

The undersigned having examined the product herein described, respectively recommends the same to the United States Centennial Commission for award, for the following reasons, viz:

Report: "Being of very Superior Quality and of great Practical Utility." DANIEL STEINMETZ.

J. D. IMBODEN of Virginia, CHARLES STAPLES of Maine, G. L. REED of Penn.

J. DIFENBACH of Germany, DAVID MCHARDY of Scotland, D. STEINMETZ of Phila.

J. DIFENBACH of Germany, DAVID MCHARDY of Scotland, D. STEINMETZ of Phila.

JUDGES: FRANCIS A. WALKER, Chief of the Bureau of Awards.

Given by authority of the U. S. Centennial Commission.

J. L. CAMPBELL, Secy. A. T. GOSHORN, Director General.

J. R. HAWLEY, Pres.

Signature of the Judge.

A true copy of the record.

Given by authority of the U. S. Centennial Commission.

J. L. CAMPBELL, Secy. A. T. GOSHORN, Director General.

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Signature of the Judge.

A true copy of the record.

Given by authority of the U. S. Centennial Commission.

THE GOOCH PATENT  
"PEERLESS"  
Ice Cream Freezer  
IT HAS NO EQUAL.



Made 2 to 10 Quarts.

I offer the trade a freezer which I represent to be better in every particular to any in the market.

I request as a favor, and for your own interest, that you order a sample. If you deal in Freezers of any make, for which I will ask no pay if it does not please you. Say what size to send.

"No sutt-e, no payee."

No risk—all gain. Send for sample and circular.

CHARLES GOOCH, Patentee,  
521 Franklin St., Philadelphia.  
109 Sycamore St., Cincinnati.

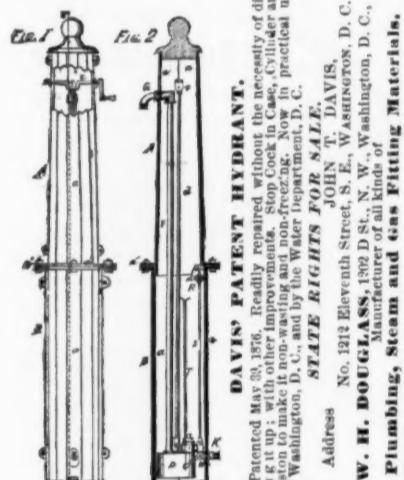
## REMOVAL.

Having removed our office to 321 Broadway, we are better prepared to furnish Star Rods of every style and kind: Dog Collars, in Leather, Chain, Brass, Nickel and Silver; Patent Automatic Dog Muzzles; Brass and Zinc Stirr Plates; Brass Rail for Ships, Stairs and Counter Guard; Solid Brass Tubing of several new designs. Also

IRON TUBING, BRASS COVERED, at one-third less cost than Solid Brass, and superior to the latter for many purposes.

Fender and Frame Bars, Cornice Poles, Rings and Brackets. Full assortment of Upholsterers' Hard-ware.

W. T. & J. MERSEREAU,  
Manufacturers,  
Factory, Newark, N. J.



The Oldest Shot Tower in America,  
FOUNDED JULY 4, 1808.



THOMAS W. SPARKS,  
Manufacturer of  
American Standard Drop and Buck  
Shot and Bar Lead.  
121 Walnut Street, Philadelphia.

Premium awarded by the Judges of the Centennial  
International Exposition for uniformity and general  
good finish of Pellets.

SCROLL SAWS.  
From \$5.00 to \$40.00  
each. A new and perfect  
foot power Saw for \$5.00—  
high speed, beveling table,  
18 inch swing, 1/2 inch  
stroke, finger guard and  
hold down for the work;  
folds up in small space  
when not in use.

Fuller's Attachments  
for Bracket Saws.  
Designs,  
Saw Blades, &c.

Send for 14 page illustrated list.  
AGENCY FOR  
Racine Hardware Mfg. Co., Flower Pot  
Brackets, Aquaria, Jewelers' Machinery, &c.  
Benj. F. Badger & Son, Razor Straps.  
Johnson Bros., Hand Made Files.  
W. J. Clark & Co., Automatic Fountains, &c.  
Wilson Bros., Chas. Lehman, J. A.  
Scolley, Carl Deterich, &c.  
Price lists furnished on application.

G. WEBSTER PECK,  
Manufacturers' Agent,  
110 Chambers St., New York.

THE CONNECTICUT VALLEY MFG. CO.,  
CENTERBROOK, CONN., Manufacturers of  
Lewis' Patent Single Twist Spur Bits,



GERMAN CIMLET BITS, etc.

Send for our illustrated price list and discounts.

JOB T. PUGH'S  
Celebrated AUGERS and BITS.

WARRANTED SUPERIOR TO ANY OTHER MAKE.

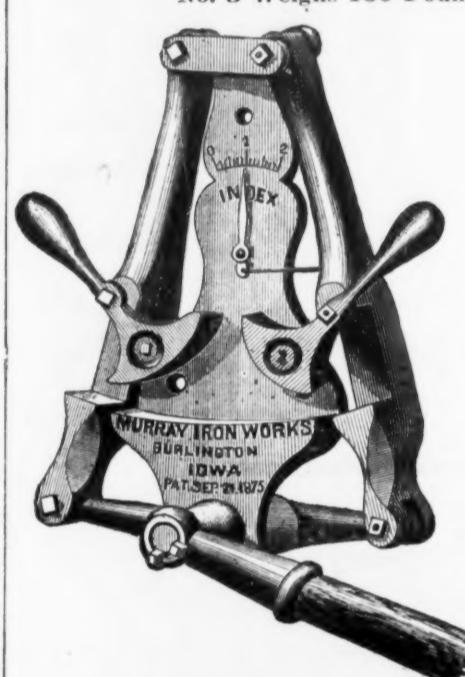
They are made entirely by hand, and are especially adapted to hard wood. Supplied to the trade only. Gas Fitters', Millwrights', and Carpenters' Augers and Bits. Machine Bits of all descriptions made at short notice.

Office and Works,  
Rear of Nos. 3112, 3114, 3116, 3118 & 3120 Market Street, Philadelphia, Pa.

THE

## "INDEX" TIRE SHRINKER!

No. 3 Weighs 180 Pounds.—Price, \$25.



The most powerful and convenient Tire Shrinker ever offered to the trade.

The Anvil affords the means of welding the Tire or Bar while in the machine; an advantage possessed by no other Shrinker made.

One man (or boy) can work it alone! And it can be used equally well right or left handed.

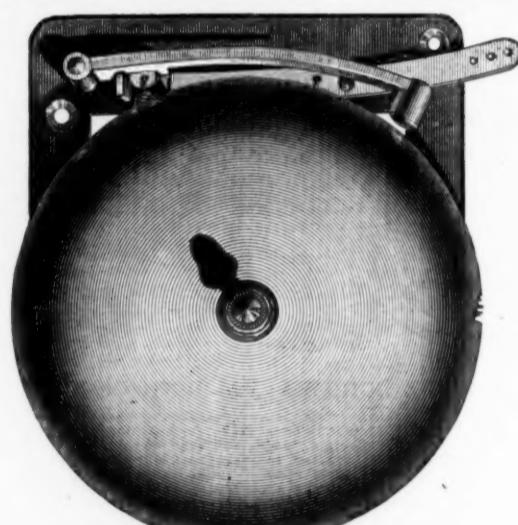
The shrinkage is made in the most perfect manner, leaving the iron unmarked, the exact amount of shrinkage being shown by the index

Adapted to light or heavy tire, and of any diameter.

These perfect Tools, in general use throughout the West, are made only by the

Murray Iron Works  
Company,  
BURLINGTON, IOWA.

## HALL DOOR GONGS.



No. 10.

These gongs are made of the best bell metal, and are warranted to give satisfaction.

5 inch, each.	\$1.60	8 inch, each.	\$5.35
4 " "	1.85	10 "	7.50
5 " "	2.20	12 "	19.50
6 " "	2.25	15 "	32.00
7 " "	4.25		

Discount to the trade, 40 per cent.

J. B. SHANNON,  
Manufacturer of Specialties in Building Hardware,  
1009 Market Street, PHILADELPHIA.

C. A. & W. L. TEAL,  
Manufacturers of IMPROVED BENDING ROLLS

Arranged for Removing Work from  
the end of top roll.

COMBINED

Punching & Shearing Machines,  
With "Automatic Stop motion,"  
Adjustable to any point of the stroke.

Single Power Punching Machines,  
With Shearing Attachments.

Steam Riveting Machines,  
Bolt Makers' and Machinists' Post  
Drilling Machines, Hair Pick-  
ing & Cleaning Machines, and

MACHINERY  
in general.

4116 Ludlow St., Philadelphia.



## The Patent Automatic Stokers

(which were shown at the Centennial Exhibition in the British section, and obtained the medal and highest awards, and the Patents for which in the United States are owned exclusively by the subscriber) are now offered for the first time to the users of steam-power in this country, with full confidence that the satisfactory results obtained in Great Britain and on the Continent of Europe (where over 1200 of them have been erected within the last few years), will be fully realized here. Some of these results are: The generation of from 25 per cent. and upward of steam from a given grate surface above what is obtained from the same quality of fuel fed by hand. The lessening of the cost of steam from 10 to 30 per cent. from being able with the Stokers to properly burn a lower priced fuel. The entire removal of the smoke nuisance. The lessening of the labor of the fireman. Their use also reduces materially the temperature of the fire room and also prevents the injury to the boiler caused by the contraction and expansion of the plates resulting from the frequent opening of the fire doors in hand firing. These and other advantages have secured their introduction into the boilers of many of the largest Mills and Iron Works in England and other countries, and we are now turning out an average of 10 machines per week. A few letters are given from some of those having them in use, the statements in which can be implicitly relied upon. For information respecting price, &c., apply to

DILLWYN SMITH,

14 S. Sixth St., Philadelphia, Pa.

Atlas Works, Hackney, Wick, October 11, 1875.  
Having used your Mechanical Stoker for 12 months, we beg to inform you that it gives every satisfaction, and, when using good small coal, finds a saving of about 15 per cent.

BROOKES, SIMPSON &amp; SPILLER,

p. p. H. J. LOWE, Chief Engineer.

From Messrs. Barlow &amp; Jones, Albert Mills,

Bolton, April 3, 1875.

Having pleasure in informing you that after a recent calculation we consider your Mechanical Stoker is saving us 12 per cent. in weight of fuel and fully 20 per cent. in cost of driving, owing to our being able to use a lower priced fuel. We have now made a 12 ft. stoker which we could not possibly have driven with hand labor. We shall be most happy to recommend the apparatus to anyone you may bring to see it.

Account of a Recent Experiment of the Comparative Results of Hand and Stoker Firing.

Albert Mills, Bolton, August 31, 1875.

Messrs. JACKSON &amp; BROS.

Dear Sirs:—The amount of coal burnt in firing by hand—average of two weeks—was 32 tons per week, against 31 tons while using the Stokers. The coal used for hand firing was Best Burgy, at 10 per ton; that for

10 per ton.

We

are

yours,

truly,

J. R. BARLOW

Memorandum from A. M. Collins, Son &amp; Co.'s Factory

Third and Oval Streets, Philadelphia.

ESTABLISHED JAN. 1841.

HEATON & DENCKLA,  
Hardware Commission Merchants,  
507 Commerce and 510 North St., Philadelphia.

## AGENCIES:

E. &amp; G. BROOKE'S Anchor Brand Cut Nails,

Mallory, Wheeler &amp; Co.'s Door and Padlocks and

Bronzed Goods,

Union Mfg. Co.'s Butt Hinges of all descriptions,

American Screw Co.'s Wood Screws,

Douglas Axe Mfg. Co.'s Edge Tools,

D. R. Barton Tool Co.'s Tools of all descriptions,

H. M. Myers &amp; Co.'s Shovels, Spades and Scoops,

Jos. Graff &amp; Co.'s Axes and Planters' Hoes,

Stuart, Peterson &amp; Co.'s Tinned, Enamelled and

Heavy Holloware,

Coil, Trace and other Chains,

Anvile and Vises,

Western File Co.'s Files of all descriptions,

Genuine A. Chester Emery,

S. S. Putnam &amp; Co.'s Hammer Pointed Forged

Horse Nails,

Foster's Forged Horse Nails,

Philadelphia Carriage and T. Re. Bolts,

Plymouth Mills' Black and Tinned Iron Rivets,

Frances' Shutter Holders,

Hussey &amp; Co.'s Cut Steel of all descriptions,

American Sugar Co.'s Sugar and Scissors,

Logan and Strobridge's Brighton Coff. &amp; Mills, &amp;c.,

Anthony &amp; Cushman's Tacks, Brads, &amp;c.

Depot for the Gaylord Mfg. Co.'s Cabinet Locks.

In addition to the above, we offer a large line of

AMERICAN HARDWARE.

C. W. PACKER'S

PATENT ICE CREAM FREEZERS.

Medal and Diploma Awarded, International Exhibition, Philadelphia, 1876.

CHARLES W. PACKER, Manufacturer, Philadelphia.

Illustrated Price List furnished on application.

R. S. NEWBOLD &amp; SON,

Norristown, Pa.

Eagle Works.

IMPROVED ROTARY SHEARS,  
Rolling Mill, Blast Furnace, Flour Mill, Mining and Water Works Machinery, Air Compressors, Ore Washers and Brick Machines.

REFERENCES:

Rotary Shears for Plates &amp; Circles.

A. Wood &amp; Co., Conshohocken, Pa.

Ernst Stridsberg, Sweden.

Lewis Dalzell &amp; Co., Pittsburgh, Pa.

H. A. Beale &amp; Co., Parkersburg, Pa.

Rolling Mill &amp; Blast Furnace Plants &amp; Engines.

Merton Furnaces, Conshohocken, Pa.

Aurora Furnace, Wrightsville, Pa.

Norristown Water Co., Norristown, Pa.

Oliver &amp; Co., Easton Sheet Mill.

Portsmouth Iron Co.'s Plate Mill.

Parkersburg Fly Mill.

Morris, Tamm &amp; Co., Engines.

Durey and Marais' French Pat. Brick Machine.

For Brick Yards and Fire Brick Works, makes 10,000 superior bricks per day, with 1/2 horse power. In use at Brookville brick yards, Lumburg, Va.; F. W. Kicknich, Waukesha, Wis.; Chattanooga Fire Brick Works, &amp;c., Louis, Mo. Can back bricks 12 high at once. The best, simplest and cheapest machine made.

J. S. PROUTY, Frest.

Prouty Hardware and Manufacturing Co., Wholesale dealers in

FOREIGN &amp; DOMESTIC HARDWARE, &amp;c., &amp;c.

Agents for Amwak's Scandinavian or Jail Locks.

A large lot of Birmingham Shovels at job prices.

All kinds of General Merchandise.

No. 53 Beekman Street, New York.

A. H. GOSS, Secy and Treas.

Prouty Hardware and Manufacturing Co., Wholesale dealers in

## More Mechanical Miracles.

The Keely motor is a good deal like the Proteus of the fable. It has reappeared this time as the "Bradley Promethor," and concerning it the Philadelphia *Herald* gives its readers the following valuable information. It is the most important contribution to the literature of mechanics since Mother Goose's Melodies were written:

It was in reading from the passage in Genesis that after God had created man, He breathed into his nostrils the breath of life, and he became a living soul, that Mr. Bradley, a clergyman by profession, although brought up to the machinist's trade, and a scientist by nature, first conceived the idea of his invention. Man is a machine, and his physical organism must be conceived in wisdom. The inventor's mind at once determined upon investigating the principles of the human physiology, and this extraordinary machine is the result. Then arose the question of the power—the "breath of life"—and it was found hidden away in the steam boiler, where it had been lurking for three-quarters of a century, confounding the learned in science, puzzling the practical man of steam, and causing destruction to thousands of human lives. This heretofore destructive element our inventor has harnessed, and makes it at the same time a harmless and a useful servant. This brings us to the disputed question of physical science, to which we again advert for the purpose of directing attention to a subject of great importance to the progress of knowledge. In the wide field of investigation—surgical, anatomical and practical—pursued by this inventor during the months and years of thought which he has given to the elucidation of his convictions, he has developed a single principle in the animal economy which runs counter to one of the best received theories of physical science, and which, from its importance, it would be premature to do more than broach in a casual article. But, in order to establish for Mr. Bradley the credit due to him of this notable innovation of a theory adopted two centuries and a half ago, and ever since the days of Harvey accepted as a dogma in physiology, I may state in advance that he has demonstrated by numerous experiments that it is the respiration of the lungs and not the action of the heart which moves the circulation in animal life. In other words, that the lungs are the primary organ of the physical economy. We will not at present go any further into this part of our subject, but propose in a very few weeks to demonstrate the proposition by the movements of the invention itself. The machine is a simple framework with stationary pistons fixed in chambers corresponding to the auricle and ventricle of the human heart; the heart-shaped cylinder moving upon the pistons, and not the pistons through the cylinder. This movement measurably represents the action of the heart, and is not fanciful, but essential to the strength and perfect working of the machine. Small, spherical, heated cells or generators, corresponding to the human lungs, receive jets of water reduced by pressure to a delicate spray, creating instantaneously an all powerful and steady force, regulated in quantity by the number of generators employed. The power is an undefined, vaporous decomposition produced by the action of water in contact with dry heat, the water in the operation being perfectly decomposed and effecting a chemical phenomenon difficult of designation. The heating apparatus is enclosed in an airtight chamber, the smoke being returned and consumed. There is, consequently, no discharge of smoke or cinders. Locomotives will no longer discharge their offensive burdens into the eyes and ears and laps of travelers, nor the escape of the steam boiler drown the voice of conversation.

A machine of 100 horse-power does not occupy a greater space than 6 feet square and as many in height, and thrice that room will suffice for a machine of the power of 3000 horses, and so on to any requirement whatever.

While there is scarcely any limit to the power of this King of Forces, it is so disposed as to be perfectly harmless in the use. There can be no rupture further than the possible cracking of one or more of the generators, which are of very small size and nearly independent of each other. Mr. Bradley has purposely ruptured them under a pressure of many thousand pounds, but there is no flying off, and they are so constructed as to be removable at will.

The comparative consumption of fuel to produce the same amount of force may be estimated generally at less than one-fourth of that required by steam-power. The saving cannot be stated with entire exactness until proved by use; but the consumption cannot exceed in bulk a fourth of that required by the steam engine, and the cost of the Promethor as an engine is in still less proportion, there being no bulky boilers, smokestacks, or other heavy adjuncts. This inventor does not believe that any useful power can be developed from any natural element without external aid or heat in some form, and thinks that he has economized that important element so that no machine can be simplified below the standard he has obtained in the consumption of fuel.

To sum up, I may remark: First, that the motor employed in this invention is a well-known agent, and one that is, beyond comparison, powerful in action and easy of management. Second, that the mode of utilizing it is marvelously simple, original and perfect. Third, that its economy is marked, being as one to five, if not six or eight, in comparison with that of steam. Fourth, that it is managed so as to be positively non-explosive and without danger of any stage. Fifth, that the machine is suitable for all mechanical purposes, and finally, it is unlike anything else in the world of mechanics, and will excite an interest in economics and revolutionize the present mode of propulsion in every department of mechanical motion. The machine and its capacities are not simply a great invention; they are an inspiration utilizing the forces of nature by the principles of natural laws, and confirming to the conceptions of man the perfections of the Divine intelligence in His works. In a few weeks the public will have an opportunity of seeing in operation a Promethor of the power of 50 horses which is now nearly ready for exhibition.

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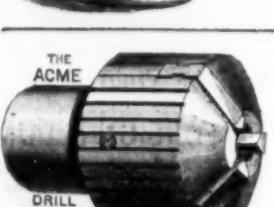
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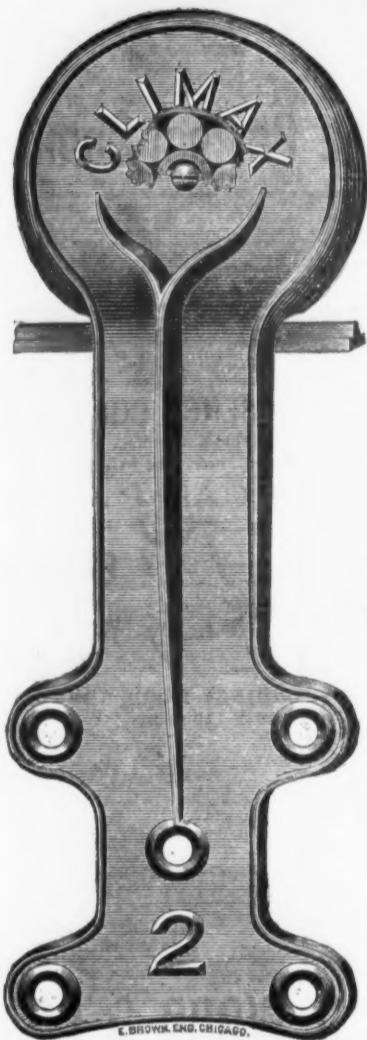
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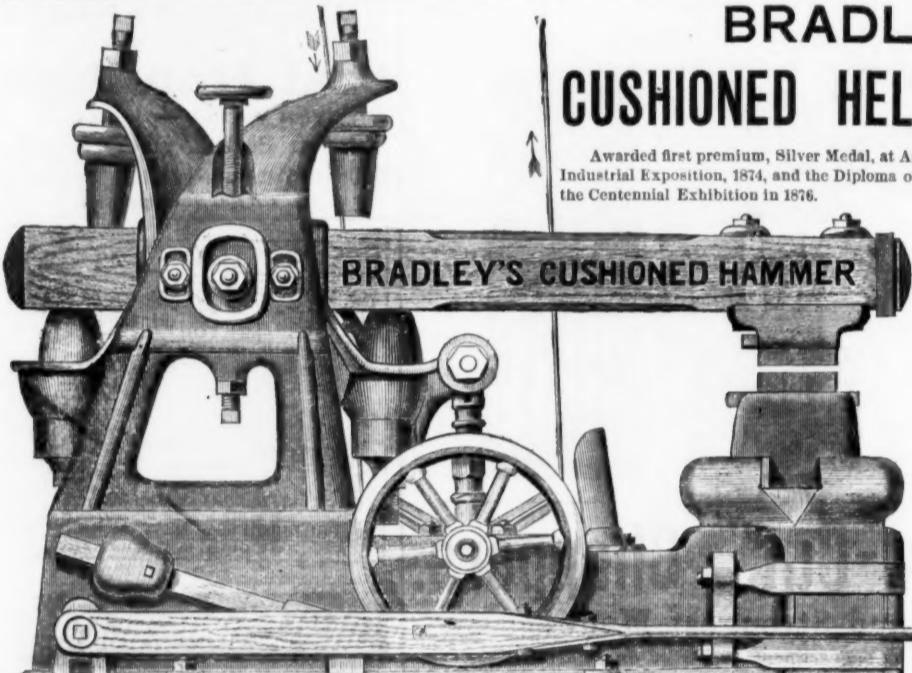
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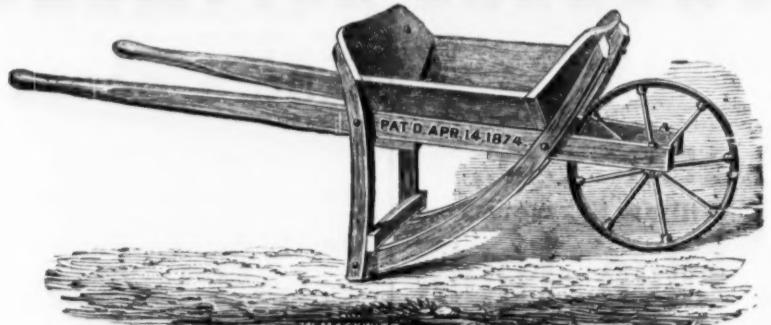
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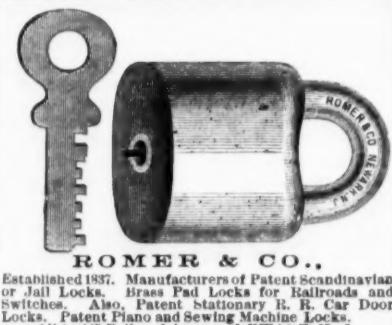
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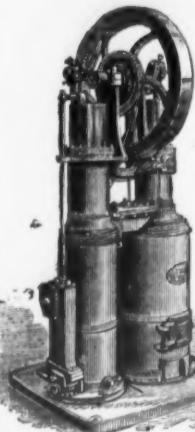
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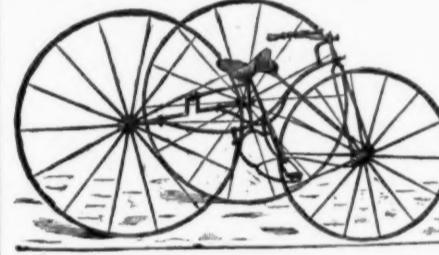
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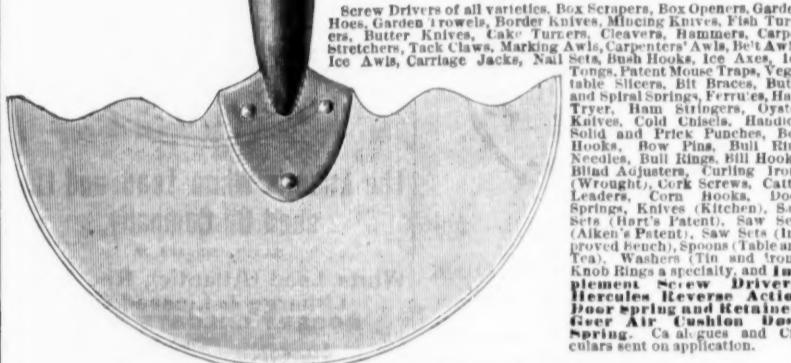
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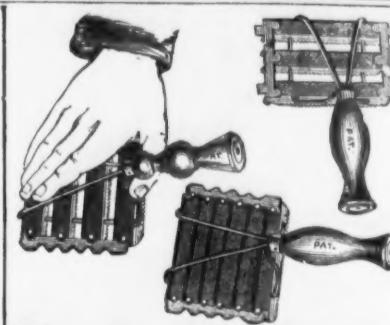
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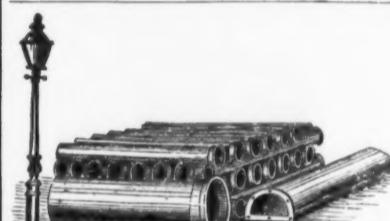
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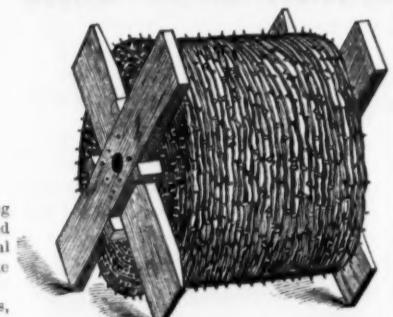
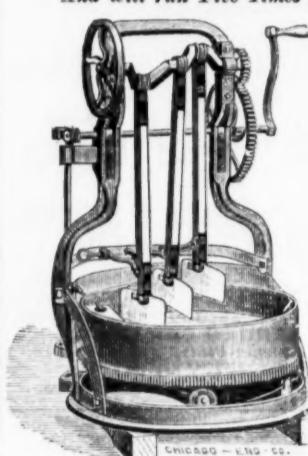
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Bilms, Booth & Haydens 49 Chambers, N. Y.	3
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Plumb & Arrow Mfg. Co., 80 Chambers, N. Y.	3
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The Wilmot Mfg. Co., 50 Barclay, N. Y., and 90 John, Bridgeport, Conn.	3
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Carnell F. L. & D. H., 1845 Germantown Ave., Phila.	33
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Pope Co., 5 Co., Baltimore, Md.	12
The New Haven Copper Co., 255 Pearl, N. Y.	12
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New York Knife Co., Walden, N. Y.	25
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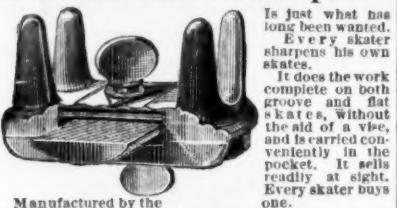
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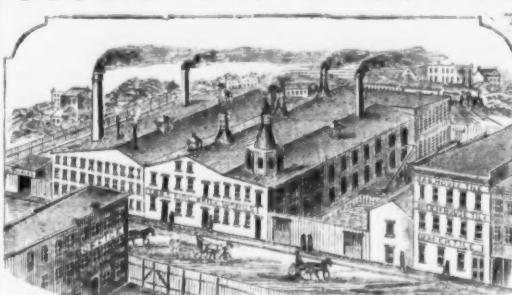
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Applicable to every grade of machinery. Send for Cir-

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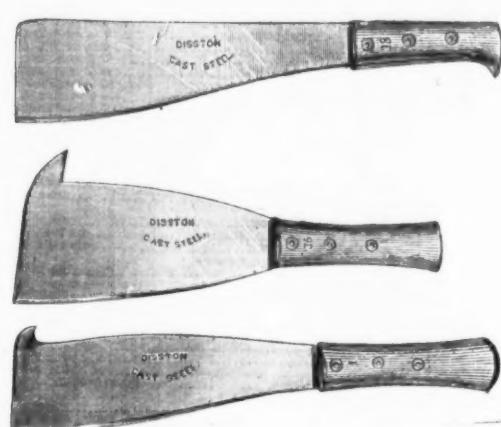
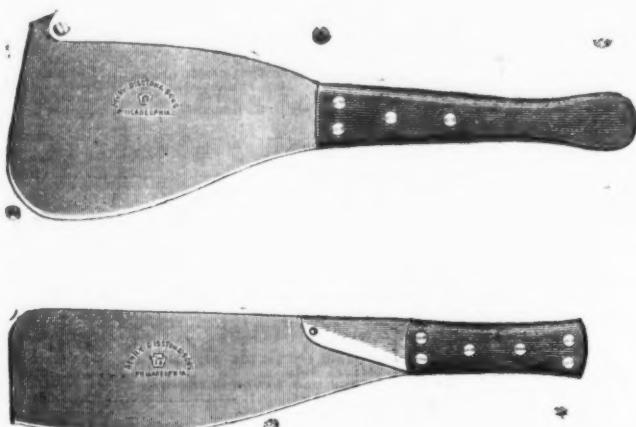
# Keystone Saw, Tool, Steel and File Works,

Front and Laurel Streets, Philadelphia.

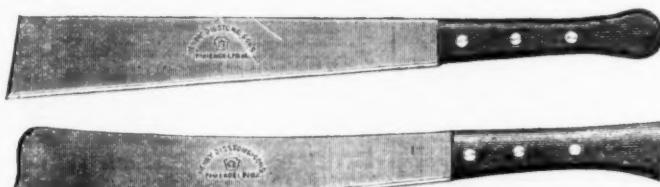
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MANUFACTURERS OF

### SAWS OF EVERY DESCRIPTION; TOOLS, FILES AND STEEL.



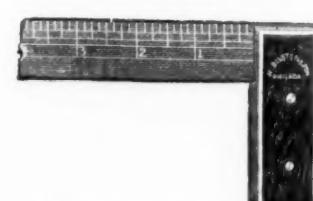
Warranted Cast Steel Cane Knives.



Disston's Celebrated Corn Knives.



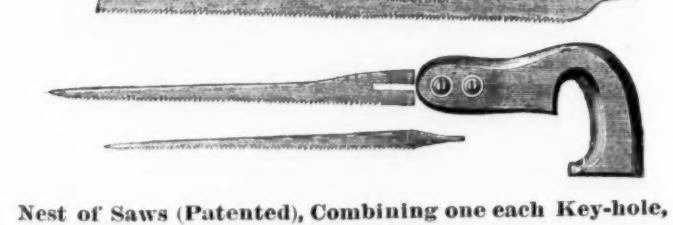
Gauges.



Improved Try Square.



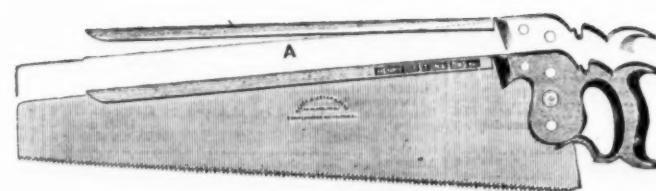
Rosewood Bevels, 6 to 14 inch.



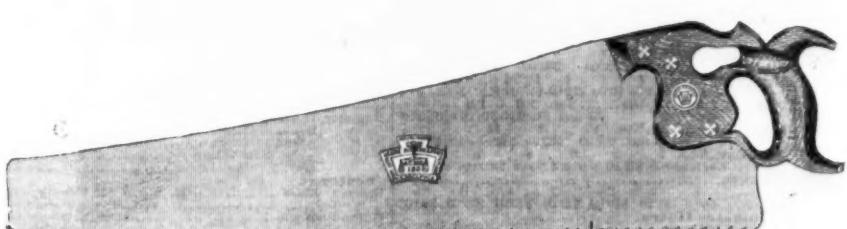
Nest of Saws (Patented), Combining one each Key-hole, Compass and Table or Pruning Saw.



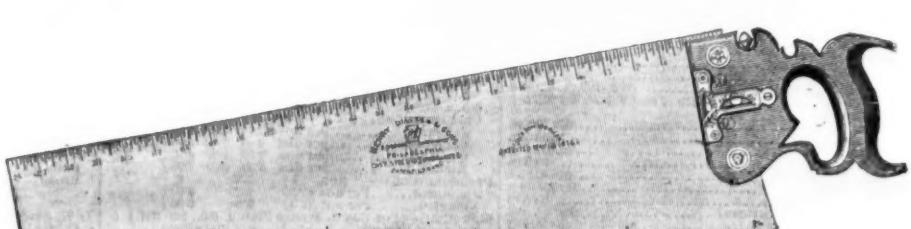
Key-Hole Saw and Pad.



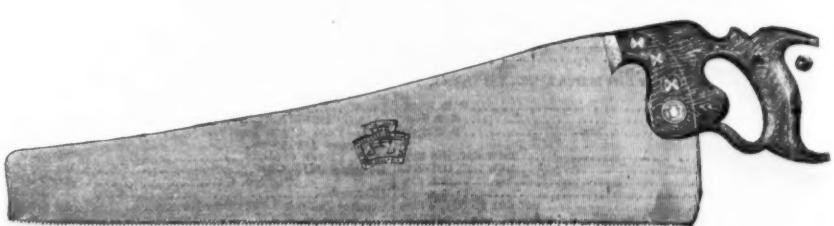
Hand Saw, with Moveable Back.



Patent Double Grip Skew Back Saw.



Patent Improved Combination Saw.



Patent Skew Back, No. 76.



No. 7 Hand Saw.

## New York Wholesale Prices, May 9, 1877.

## **HARDWARE.**



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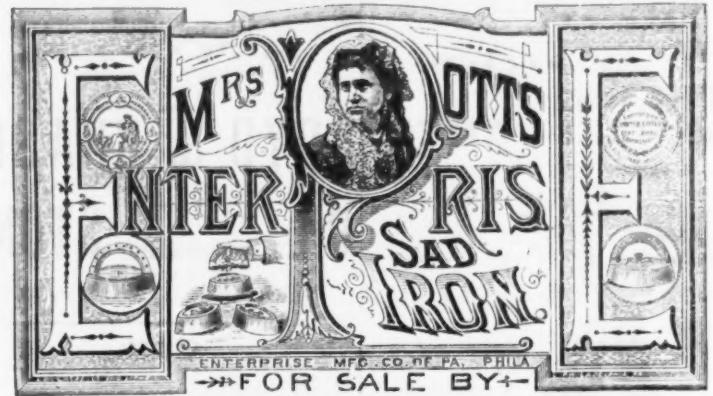
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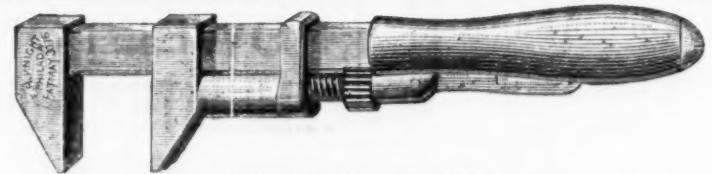
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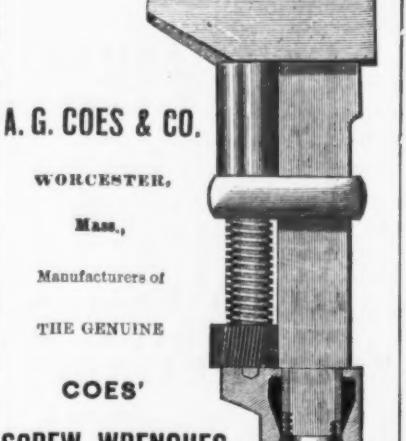


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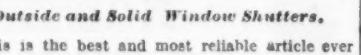
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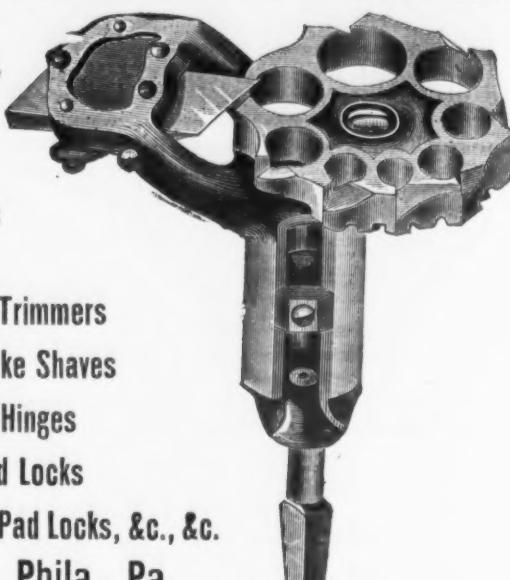
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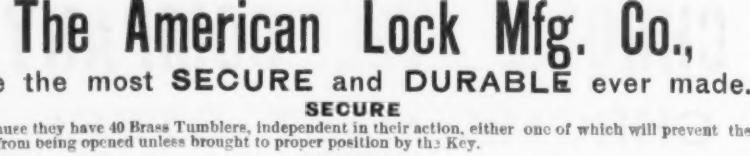
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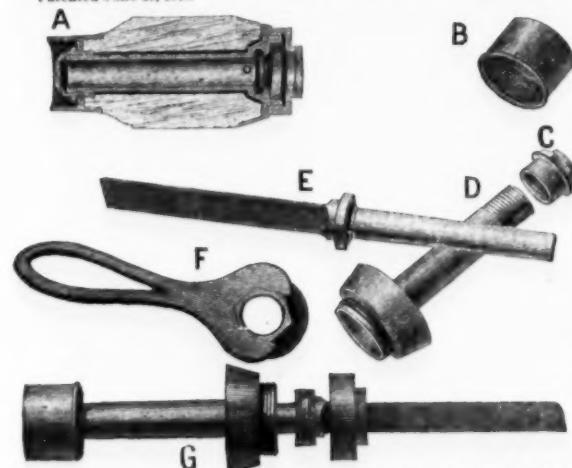
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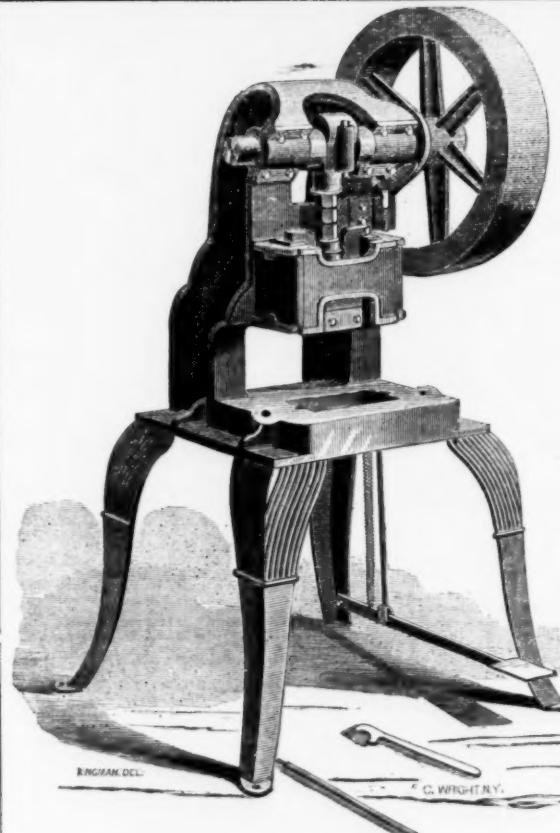
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Drawings made to order. Repairing of all kinds  
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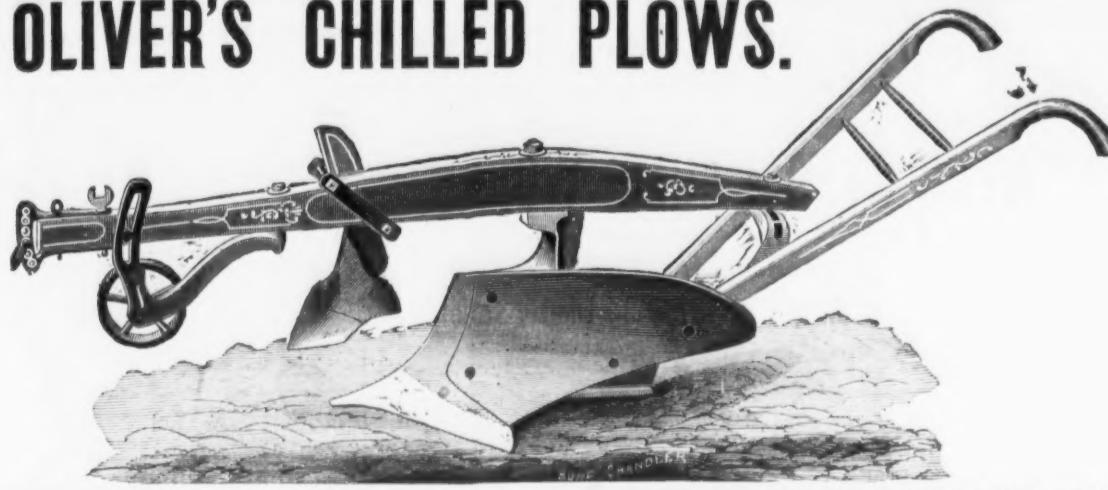
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Send for Price List.



The Cheapest and most  
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as represented, and  
trial orders solicited.

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Made of JESSOP'S BEST CAST STEEL, and warranted superior to any other

Two sizes: Large Size Boring,  $\frac{1}{2}$  to 3 inches; Small Size Boring,  $\frac{1}{2}$  to  $1\frac{1}{2}$  inches.



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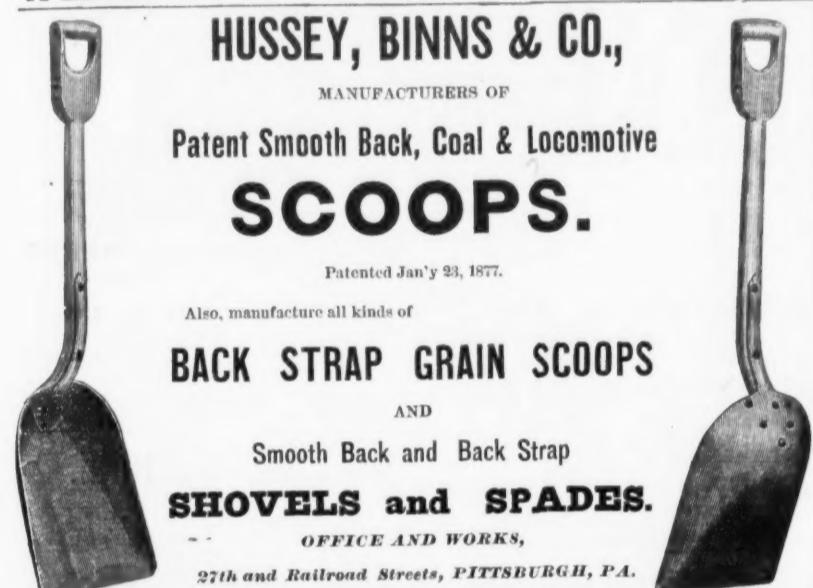
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The most complete Wheel Horse Rake ever made. Cheap, light and warranted good. No side draft. Dumps at any height. Can be set to glean or rake heavy grass. Dumps with the foot; hand dump also. Best steel teeth and most approved tooth holder. Easy draft. Works perfectly and not liable to get out of order.

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Capacities from 1 to 1000 tons.

This machine is used on a crane or any lifting apparatus, and indicates the weight on the dial directly the article is lifted. It is accurate, requires no adjusting, portable, and the greatest labor-saving weight ever introduced. Send for Circular and Price List.

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Suspended Self-Indicating  
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Capacities from 1 to 1000 tons.

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any lifting apparatus, and indicates

the weight on the dial directly

the article is lifted. It is accurate,

requires no adjusting, portable, and

the greatest labor-saving weight ever

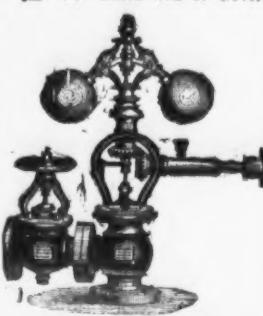
introduced. Send for Circular and Price List.

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It is a common method to advertise Governors *without cost*, unless satisfactory to the customer, and then charge *High Prices* for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Governor of Steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not for much inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in Accuracy and Durability—the main essentials—we guarantee it shall do more.

### Reduced Price List, FEBRUARY 1, 1877.

For dimensions of Governor, see Illustrated Price List.



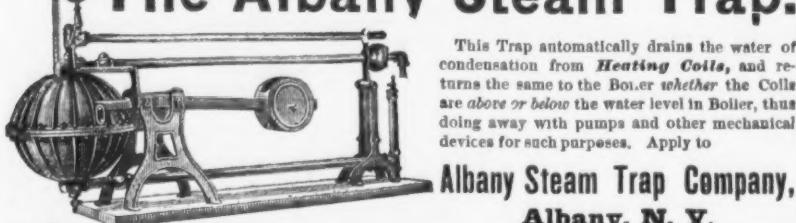
THE JUDSON PATENT  
Improved Steam Governor.

No Charge for Boxings & Cartage.

JUNIUS JUDSON & SON, Rochester, N. Y.

Size, Inch.	Plain.	Bright Fin- ished.	Extra for Spec'd.	Stop Valve.
3/8	\$16.00	\$18.00	\$1.00	..
1/2	18.00	20.00	1.00	..
1	22.00	24.00	2.25	6.00
1 1/4	33.00	35.00	2.25	6.00
1 1/2	36.00	39.00	2.50	8.00
2	51.00	55.00	2.75	10.00
2 1/2	36.00	41.00	3.50	14.00
3	52.00	57.00	4.00	16.00
3 1/2	59.00	67.00	5.00	18.00
4	69.00	78.00	5.00	20.00
4 1/2	80.00	90.00	5.50	24.00
5	90.00	101.00	6.00	40.00
5 1/2	105.00	117.00	6.50	46.00
6	130.00	133.00	7.00	54.00
7	142.00	156.00	8.00	65.00
8	175.00	192.00	9.00	79.00
9	198.00	218.00	10.00	..
10	210.00	240.00	12.00	..

## The Albany Steam Trap.

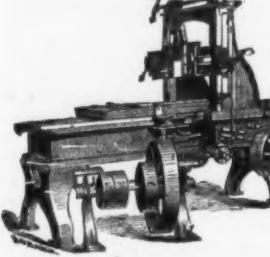


Albany Steam Trap Company,  
Albany, N. Y.

This Trap automatically drains the water of condensation from *Heating Coils*, and returns the same to the Boiler whether the Coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Apply to

## The Pratt & Whitney Co., Hartford, Conn.

Have constantly on hand and making



## Drop Hammers

Of recently Improved Construction. Pony Trip Hammers, Blacksmiths' Sheaves, Broaching and Stamping Presses, Iron Shop Cranes, Machinists' Tools, Gun and Sewing Machine Machinery. Make to order Gray and Charcoal Iron Castings of all styles and sizes not exceeding 15 tons weight, (making patterns if desired). Furnish Clamp Pulleys of light patterns, cut gears in a superior manner, &c. &c.



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CHESTER, PA.  
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Shafting & Gearing.  
Boiler Makers.



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Engines all styles, on Hand  
and made at Short Notice.

Vertical Engine.

Send for Price Lists of Engines, Boilers, &c.



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21st Street, above Market, Philadelphia.

PORTABLE DRILLS. Driven by power in any direction.  
RADIAL DRILLS. Self-feeding—Large Adjustable Box Table.  
VERTICAL DRILLS. Self-feeding.  
MULTI-TIP DRILLS. 2 to 10 Spindles.  
HORIZONTAL BORING AND DRILLING MACHINES.  
HAND DRILLS. CAR BOX DRILLS.  
SPECIAL DRILLS. For Special Work.

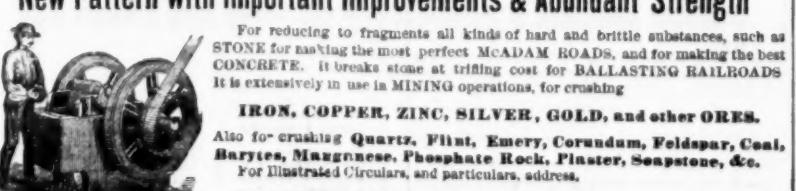


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Augusta, Me.

SPECIALTIES.—Stone Cutters' Hammers and Tools, Quarrymen's Drills, Wedges and Half Rounds, &c., &c., Miners' Hammers and Tools, Blacksmiths' Hammers and Tools, Patent Hammers for picking burr stone. Also the common Mill Picks and Wood wedges. Steel or Iron, R. R. said eye Picks, with one lb. of best Cast steel in each pick, and guaranteed inferior to none, both in quality and style of finish. All hammers have the eyes and riveted faces, and are solid and well made. No castings are made, except for the casting at Augusta; shipping facilities are excellent. Hammers made to any pattern or drawing. Capacity of works, one ton of hammers per day. A full line of the above goods constantly in stock. Catalogue on application.

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New Pattern with Important Improvements & Abundant Strength



For reducing to fragments all kinds of hard and brittle substances, such as STONE for making the most perfect MCADAM ROADS, and for making the best CONCRETE. It breaks stone at trifling cost for BALLASTING RAILROADS. It is extensively in use in MINING operations, for crushing

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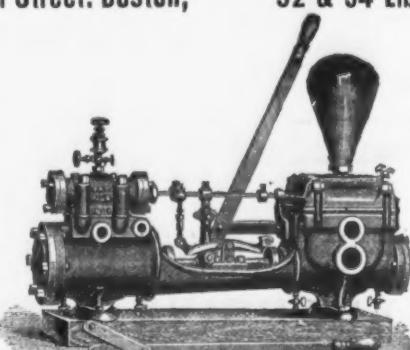
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MANUFACTURED BY THE

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## The C. O. D. Engine COSTS LESS.

And is equal to any Engine in the market.

ALL WORKING PARTS WELL FINISHED.

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No. 2, " 5x7.....150.00

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SCRIPTURE'S FUNNEL TOP OILERS.

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Anti-friction and noiseless; maximum blast and minimum power; all sizes for

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I warrant every part of this Machine to stand the shock  
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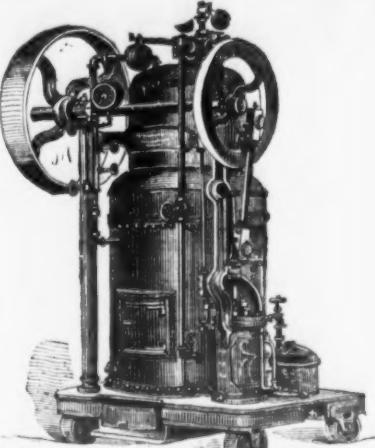
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COMPACT,  
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\$200.00.Cheaper than any Engine offered of  
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Binghamton Iron Works,  
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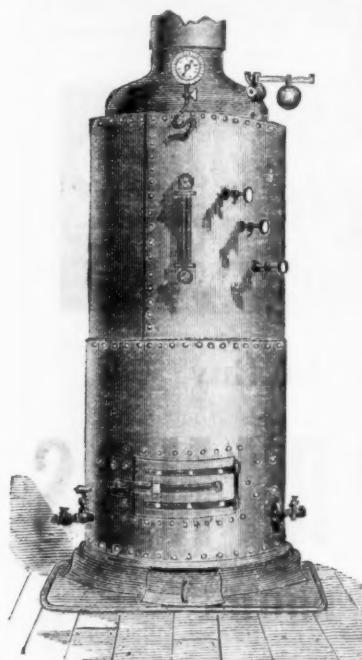
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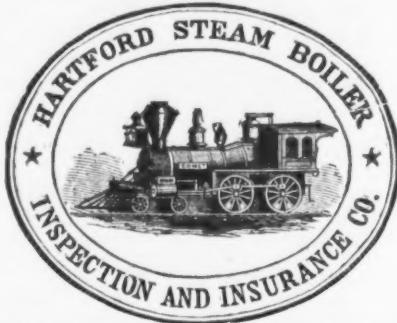
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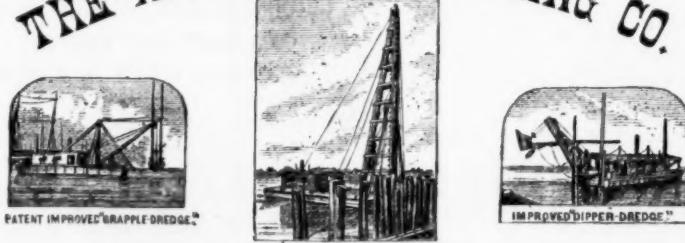
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SMALL  
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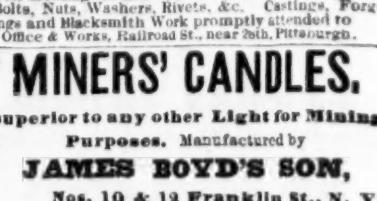
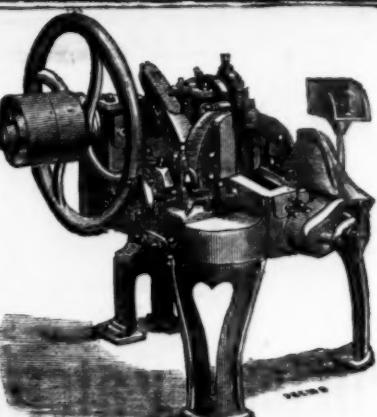
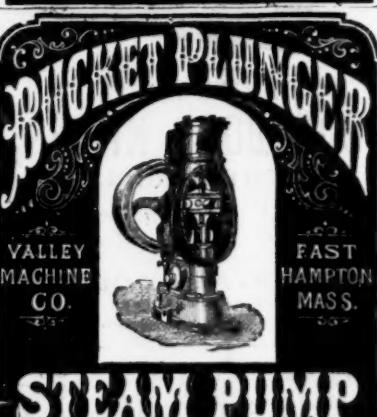
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XXX	Genuine.	55c	C	17c
XX		35c	D	14c
X		30c	E	12c
		25c	F	10c
B		30c		

Note.—The above are my standard mixtures, and have given satisfaction wherever used, but I am prepared to make Anti-Friction Metal of any quality or mixture desired by the purchaser.

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**OLD METALS AND  
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**BRASS CASTINGS.**

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CAST SPRING AND PLOW STEEL.  
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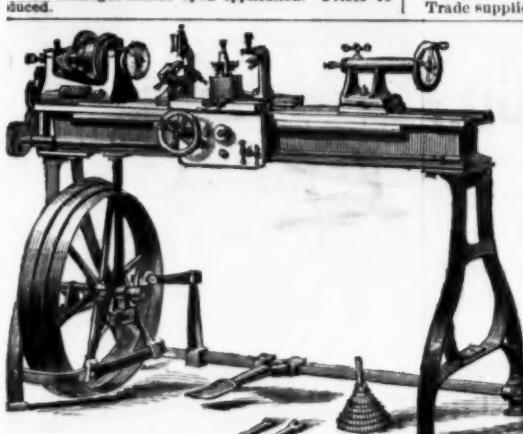
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**WOOD DOOR KNOBS,**  
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Manufactured by  
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New catalogue mailed upon application. Prices reduced.



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MANUFACTURED BY  
**E. E. FILLMORE & CO.,**  
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Wherever these Tweers are well known they are preferred over all others. Will furnish them finished or unfinished. Would suggest as the best plan the buying of one finished, as a sample, balance unfinished.

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**STEEL CASTINGS.**

A Substitute for Steel and Wrought Forgings.

Circulars sent on application.

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We make Steel Castings true to pattern, sound and strong. Can be worked same as bar steel. Plowshares, Mold-boards and Land-sides, Anthracite Coal-breaker Teeth, Wheels and Pinions, Dies and Hammer Heads, Engine and Machinery Castings of all descriptions, Railroad Frogs and Crossings. Invaluable for all articles requiring great strength and durability.

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